Authority: 49 U.S.C. 106(g), 40113, 44701.

§ 39.13 [Amended]

2. The FAA amends § 39.13 by adding the following new airworthiness directive:

Honeywell International Inc. (formerly AlliedSignal Inc. and Garrett Turbine Engine Co.): Docket No. FAA–2007–29092; Directorate Identifier 2007–NE–30–AD.

Comments Due Date

(a) The Federal Aviation Administration (FAA) must receive comments on this airworthiness directive (AD) action by December 4, 2007.

Affected ADs

(b) None.

Applicability

(c) This AD applies to Honeywell International Inc. ATF3–6–4C, ATF3–6A–3C, and ATF3–6A–4C turbofan engines equipped with part number (P/N) 3002070–1 low pressure compressor (LPC) aft shaft. These engines are installed on, but not limited to, Dassault Aviation Fan Jet Falcon Series G (Falcon 20G/HU25), and Dassault Aviation Mystere-Falcon 200 airplanes.

Unsafe Condition

(d) This AD results from reports of eight LPC aft shafts found cracked during fluorescent penetrant inspection (FPI). We are issuing this AD to prevent uncoupling and overspeed of the low pressure turbine, which could result in uncontained engine failure and damage to the airplane.

Compliance

(e) You are responsible for having the actions required by this AD performed within the compliance times specified in Table 1 and Table 2 of this AD, unless the actions have already been done.

TABLE 1.—ATF3–6A–4C TURBOFAN ENGINES, LPC AFT SHAFT REPLACEMENT COMPLIANCE SCHEDULE

For ATF3–6A–4C turbofan engines, if the cycles-since-new (CSN) on the effective date of this AD are:	Then replace the LPC aft shaft:
(1) 6,500 or more CSN	Within an additional 100 cycles-in-service (CIS).
(2) 5,000 to 6,499 CSN	Within an additional 800 CIS, but not more than 6,600 CSN, whichever occurs first.
(3) 4,000 to 4,999 CSN	Within an additional 1,500 CIS, but not more than 5,800 CSN, whichever occurs first.
(4) Fewer than 4,000 CSN	Within an additional 2,000 CIS, but not more than 5,500 CSN, whichever occurs first.

TABLE 2.—ATF3–6–4C AND ATF3–6A–3C TURBOFAN ENGINES, LPC AFT SHAFT REPLACEMENT COMPLIANCE SCHEDULE

For ATF3–6–4C and ATF3–6A–3C turbofan engines, if the CSN on the effective date of this AD are:	Then replace the LPC aft shaft:
(1) 4,400 or more CSN	Within an additional 100 CIS.
(2) 3,600 to 4,399 CSN	Within an additional 500 CIS, but not more than 4,500 CSN, whichever occurs first.
(3) 3,300 to 3,599 CSN	Within an additional 700 CIS, but not more than 4,100 CSN, whichever occurs first.
(4) Fewer than 3,300 CSN	Within an additional 1,000 CIS, but not more than 4,000 CSN, whichever occurs first.

LPC Aft Shaft Replacement

(f) Using the compliance schedule in Table 1 or Table 2 of this AD as applicable, remove the LPC aft shaft P/N 3002070–1, from service, and install a serviceable LPC aft shaft.

Definition

(g) For the purpose of this AD, a serviceable LPC aft shaft is an aft shaft with a P/N not referenced in this AD.

Alternative Methods of Compliance

(h) The Manager, Los Angeles Aircraft Certification Office, has the authority to approve alternative methods of compliance for this AD if requested using the procedures found in 14 CFR 39.19.

Related Information

(i) Honeywell International Inc. Service Bulletin No. ATF3–72–6240, Revision 1, dated May 14, 2007, pertains to the subject of this AD.

(j) Contact Joseph Costa, Aerospace Engineer, Los Angeles Aircraft Certification Office, FAA, Transport Airplane Directorate, 3960 Paramount Blvd., Lakewood, CA 90712–4137; e-mail: *joseph.costa@faa.gov*; telephone: (562) 627–5246; fax: (562) 627–5210.

Issued in Burlington, Massachusetts, on October 1, 2007.

Peter A. White,

Acting Manager, Engine and Propeller Directorate, Aircraft Certification Service.

[FR Doc. E7–19684 Filed 10–4–07; 8:45 am]

BILLING CODE 4910–13–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 91

[Docket No. FAA–2007–29305; Notice No. 07–15]

RIN 2120–AI92

Automatic Dependent Surveillance—Broadcast (ADS–B) Out Performance Requirements To Support Air Traffic Control (ATC) Service

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: This notice proposes performance requirements for certain avionics equipment on aircraft operating in specified classes of airspace within the United States National Airspace System. The proposed rule would facilitate the use of Automatic Dependent Surveillance-Broadcast (ADS–B) for aircraft surveillance by Federal Aviation Administration and Department of Defense air traffic controllers to accommodate the expected increase in demand for air transportation. In addition to accommodating the anticipated increase in operations, this proposal, if adopted, would provide aircraft operators with a platform for additional flight applications and services.

DATES: Send your comments on or before January 3, 2008.

ADDRESSES: You may send comments identified by Docket Number FAA–2007–29305 using any of the following methods:

- *Federal eRulemaking Portal:* Go to *http://www.regulations.gov* and follow the online instructions for sending your comments electronically.
- *Mail:* Send comments to the Docket Management Facility; U.S. Department of Transportation, 1200 New Jersey Avenue, SE., West Building Ground

Floor, Room W12–140, Washington, DC 20590–0001.

- *Hand Delivery or Courier:* Bring comments to the Docket Management Facility in Room W12–140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.
- *Fax:* Fax comments to the Docket Management Facility at 202–493–2251.

Privacy Act: We will post all comments we receive, without change, to *http://www.regulations.gov*, including any personal information you provide. Anyone is able to search the electronic form of all comments received into any of our dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, etc.). You may review DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (65 FR 19477–78) or you may visit *http://DocketInfo.dot.gov*.

Docket: To read background documents or comments received, go to *http://www.regulations.gov* at any time and follow the online instructions for accessing the docket. Or, go to the Docket Management Facility in Room W12–140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: Vincent Capezzuto, Surveillance and Broadcast Services Office, Air Traffic Organization, Federal Aviation Administration, 800 Independence Avenue SW., Washington, DC 20591; telephone 202–385–8288.

SUPPLEMENTARY INFORMATION:

Comments Invited

The FAA invites interested persons to participate in this rulemaking proposal by submitting written comments, data, or views. We also invite comments relating to the economic, environmental, energy, or federalism impacts that might result from adopting the proposals in this document. The most helpful comments reference a specific portion of the proposal, explain the reason for any recommended change, include specific rule language changes, and include supporting data. We ask that you send us two copies of written comments.

We will file in the docket all comments we receive, as well as a report summarizing each substantive public contact with FAA personnel concerning this proposed rulemaking.

Before acting on this proposal, we will consider all comments we receive on or before the closing date for comments. We will consider comments filed after the comment period has closed if it is possible to do so without incurring expense or delay. We may change this proposal in light of the comments we receive.

If you want the FAA to acknowledge receipt of your comments on this proposal, include with your comments a pre-addressed, stamped postcard on which the docket number appears. We will stamp the date on the postcard and mail it to you.

Proprietary or Confidential Business Information

Do not file in the docket information that you consider to be proprietary or confidential business information. Send or deliver this information directly to the person identified in the **FOR FURTHER INFORMATION CONTACT** section of this document. You must mark the information that you consider proprietary or confidential. If you send the information on a disk or CD–ROM, mark the outside of the disk or CD–ROM and also identify electronically within the disk or CD–ROM the specific information that is proprietary or confidential.

Under 14 CFR 11.35(b), when we are aware of proprietary information filed with a comment, we do not place it in the docket. We hold it in a separate file to which the public does not have access, and place a note in the docket that we have received it. If we receive a request to examine or copy this information, we treat it as any other request under the Freedom of Information Act (5 U.S.C. 552). We process such a request under the DOT procedures found in 49 CFR part 7.

Availability of Rulemaking Documents

You can get an electronic copy of rulemaking documents using the Internet by—

1. Searching the Federal eRulemaking Portal (*http://www.regulations.gov*);
2. Visiting the FAA's Regulations and Policies Web page at *http://www.faa.gov/regulations_policies/;* or
3. Accessing the Government Printing Office's Web page at *http://www.gpoaccess.gov/fr/index.html*.

You can also get a copy by sending a request to the Federal Aviation Administration, Office of Rulemaking, ARM–1, 800 Independence Avenue, SW., Washington, DC 20591, or by calling (202) 267–9680. Make sure to identify the docket number, notice number, or amendment number of this rulemaking.

Authority for This Rulemaking

The FAA's authority to issue rules regarding aviation safety is found in Title 49 of the United States Code. Subtitle I, Section 106 describes the authority of the FAA Administrator. Subtitle VII, Aviation Programs, describes in more detail the scope of the agency's authority.

This rulemaking is promulgated under the authority described in Subtitle VII, Part A, Subpart I, Section 40103, Sovereignty and use of airspace, and Subpart III, section 44701, General requirements. Under section 40103, the FAA is charged with prescribing regulations on the flight of aircraft, including regulations on safe altitudes, navigating, protecting, and identifying aircraft, and the safe and efficient use of the navigable airspace. Under section 44701, the FAA is charged with promoting safe flight of civil aircraft in air commerce by prescribing regulations for practices, methods, and procedures the Administrator finds necessary for safety in air commerce.

This proposal is within the scope of sections 40103 and 44701 since it proposes aircraft performance requirements that would meet advanced surveillance needs to accommodate the projected increase in operations within the National Airspace System (NAS). As more aircraft operate within the U.S. airspace, improved surveillance performance is necessary to continue to balance the growth in air transportation with the agency's mandate for a safe and efficient air transportation system.

Table of Contents

I. Background

A. Vision of the Future

The demand for air travel is growing in the U.S. and around the world. The FAA's forecasts project a doubling in U.S. airline passenger traffic by 2025. The forecasts also show strong growth for general aviation, especially with the advent of very light jets. By the end of this decade as many as 400–500 of these small jets could join the fleet each year. With the new small jets and other growth, the active general aviation fleet is projected to grow from 230,000 aircraft today to 275,000 aircraft in 2020.

That is the demand from piloted aircraft. The development and use of unmanned aircraft systems (UAS) is one of the next big steps forward in aviation's evolution. The FAA is working across government and industry to ensure the safe authorization of these aircraft to fly in civil airspace.

The good news is U.S. air travel and related use of the National Airspace System (NAS) will grow. That growth will bring challenges since the present U.S. air traffic system—the world's largest and safest—is not designed to absorb this level of growth. Today's system is limited by outmoded technology—such as the constraints ground-based radar places on the distance aircraft must be separated and the limits caused by having to transmit information by voice between aircraft and the ground.

The solution to managing the anticipated growth in the use of the NAS is the Next Generation Air Transportation System, or NextGen, which will assure the safe and efficient movement of people and goods as demand increases. NextGen will use technology to allow precise navigation, permit accurate real-time communication, and vastly improve situational awareness. The goal: A system flexible enough to accommodate safely whatever number, type and mix of aircraft there will be in U.S. skies by 2025.

NextGen will be an aircraft-centric system with performance-based requirements. The future system will describe performance for navigation, communications, and surveillance.

For navigation, the aviation community is already seeing the benefits of performance-based navigation with the use of Required Navigation Performance (RNP) as well as Area Navigation (RNAV) procedures at many U.S. airports. RNP and RNAV are examples of procedures that use improved navigational accuracy as compared to traditional procedures. The new procedures are being implemented consistent with the ''Roadmap for Performance-Based Navigation.'' The benefit of performance-based navigation: Enabling aircraft to fly precisely defined flight paths with unprecedented accuracy.

For communication, NextGen will be built on a more comprehensive and capable information network than has been previously available. It will ensure the right information gets to the right person at the right time. With performance-based navigation and internet-like access to critical information—including nearly real-time weather—pilots will be able to make precision landings at airports that have no control towers, radar, or Instrument Landing Systems. Attaining the goal of performance-based communications will depend on technology, such as datalink, which would transmit key instructions directly to aircraft flight management systems, which would speed receipt of critical information and prevent errors that can come from manual data entry.

The third element—performance-based surveillance—relies on technology that permits knowing the exact location of other aircraft in the air and of other aircraft and ground vehicles on the airport surface. The aviation community's experience with ADS–B, which periodically broadcasts an aircraft's location—both horizontal and vertical position and horizontal and vertical velocity—will lead directly to the performance requirements. When displayed in the cockpit, information obtained through ADS–B greatly improves situational awareness in the en route segment, in the terminal area during approaches, and on the airport surface. For additional information on ADS–B activities, see Section VI, FAA Experience with ADS–B later in the preamble.

This rulemaking is important because ADS–B is an essential NextGen building block. Improving surveillance requires advanced onboard equipment with backup capability. Most, if not all, of the surveillance capability as well as the navigation and communications capabilities should be onboard the aircraft so the required capabilities will go wherever the aircraft goes. As part of the rulemaking effort, the FAA established an Aviation Rulemaking Committee under Order 1110.147. This committee has been chartered to deliver a report on how to optimize operational benefits of the ADS–B system and to provide recommendations to the FAA on the rulemaking after the NPRM is published. The scope of the ARC membership is designed to provide the widest range of inputs into the development of the NextGen strategy. The FAA will put the ARC recommendations in the docket established for this rulemaking.

It is this combination of onboard capability and performance expectations that will enable aircraft in the future to fly safely and efficiently despite ever-increasing demands on the airspace.

B. The Century of Aviation Reauthorization Act and NextGen

The ''Century of Aviation Reauthorization Act'' was enacted on December 12, 2003 (Pub. L. 108–176) (the ''Act''). This law set forth requirements and objectives for transforming the U.S. air transportation system to meet the needs of the 21st Century. Section 709 of the Act required the Secretary of Transportation to establish in the FAA a joint planning and development office (JPDO) to manage work related to NextGen. Among its statutorily defined responsibilities, the JPDO coordinates the development and utilization of new technologies to ensure that when available, they may be used to the fullest potential in aircraft and in the air traffic control system.

The FAA, the National Aeronautics and Space Administration (NASA) and the Departments of Commerce, Defense, and Homeland Security have launched an effort to align their resources to develop and further evolve NextGen. The goals of NextGen, as stated in the Act, that are addressed by this proposal are:

(1) Improve the level of safety, security, efficiency, quality, and affordability of the NAS and aviation services;

(2) Take advantage of data from emerging ground-based and space-based communications, navigation, and surveillance technologies;

(3) Be scalable to accommodate and encourage substantial growth in domestic and international transportation and anticipate and accommodate continuing technology upgrades and advances; and

(4) Accommodate a wide range of aircraft operations, including airlines,

air taxis, helicopters, general aviation, and UAS.

The JPDO was also charged with creating and carrying out an integrated plan for NextGen. The Act mandates that the NextGen Integrated Plan (the ''Plan'') be designed to ensure that the NextGen system meets the air transportation safety, security, mobility, efficiency, and capacity needs beyond those currently included in the FAA's Operational Evolution Plan.[1] As described in the Plan [2], the current approach to air transportation, where ground based radars track flights along congested airways, and pass information among the control centers for the duration of the flights, is becoming operationally obsolete. The current system is increasingly inefficient, and large increases in air traffic will result in mounting delays or limitations in service for many areas in the NAS.

As detailed in the Plan, the demand for air travel is expected to double within the next 20 years. Current FAA projections are that by 2025, operations will grow to more than half a million departures and arrivals per year at approximately 16 additional airports. The present air traffic control system will be unable to handle this level of growth. Not only will the current method of handling traffic flow not be able to adapt to the highest volume and density for future operations, but the nature of the new growth may be problematic, as future aviation activity will be much more diverse than it is today. A shift of 2 percent of today's commercial passengers to very light jets that seat 4–6 passengers would result in triple the number of flights necessary to carry the same number of passengers.[3] Furthermore, the challenges grow with the advent of other non-conventional aircraft, such as the UAS.

The future of air transportation contemplated in the Plan is complex, and the FAA believes that ADS–B technology is a key component in achieving many of the goals set forth in the Plan. This proposed rule embraces a new approach to surveillance performance requirements that can lead to greater and more efficient use of airspace. The Plan articulates several large transformation strategies to create the NextGen System. This proposal is a major step toward strategically ''establishing an agile air traffic system that accommodates future requirements and readily responds to shifts in demand from all users.'' ADS–B technology will assist in the transition to a system with less dependence on ground infrastructure and facilities, and would provide for more efficient use of airspace.

C. Today's Radar Environment

In the U.S., Air Traffic Control (ATC) surveillance and aircraft separation services are provided by the use of primary and secondary surveillance radar systems. While radar technology has advanced, it is essentially a product of 1940s World War II technology. Both primary and secondary radars are very large structures that are expensive to deploy and maintain; they also require the agency to lease land for site installation.

Primary radar is a passive detection method that requires no special equipment aboard the aircraft. It is a technology that transmits a beam that is reflected by a target. This reflection forms a return signal that is translated into an aircraft position by ATC automation systems. Primary radar, however, is not always able to distinguish aircraft from other objects that reflect radar beams, such as birds or severe weather, which can result in ''clutter'' on the ATC radar scope. In addition, with primary radar, ATC is provided only with an aircraft's position relative to time. It does not provide any other information about the aircraft.

Primary radar measures both the range and bearing of a particular aircraft. Bearing is measured by the position of the rotating radar antenna when it receives a response to its signal that is reflected from the aircraft. Range is measured by the time it takes for the radar to receive the reflected response. Detecting changes in an aircraft's velocity requires several radar sweeps that are spaced several seconds apart. Because the antenna beam becomes wider as the aircraft travels farther away from the radar, the accuracy of the radar is a function of range, and the accuracy decreases as the distance between the aircraft and the radar site increases. Consequently, aircraft on the outer fringes of radar coverage or in non-radar areas are separated by greater distances, directly affecting efficiency and ultimately capacity in the NAS.

A Secondary Surveillance Radar (SSR) system consists of antennas, transmitters, and processors installed in ATC facilities, and radio transponder devices that are installed in aircraft. This system enhances primary radar by improving the ability to detect and identify aircraft. An SSR transmits interrogation pulses that elicit responses from transponders on board the aircraft. A transponder installed on the aircraft ''listens'' for the interrogation signal and sends back a reply that provides aircraft information. The aircraft is then displayed as a tagged icon on the air traffic controller's radar screen.[4]

Each transponder category has unique characteristics, operating functions, and requirements. A transponder with Mode A functionality requires the pilot to input a discrete code. If the same transponder is connected with an encoding device then it will also report the aircraft's altitude (Mode C). Most aircraft operated in general aviation have Mode A/C transponders. Any aircraft required to have Traffic Alert and Collision Avoidance System (TCAS) II, or that voluntarily has TCAS II installed must also be equipped with a Mode S Transponder. (This generally includes aircraft operated under parts 121, 125, 129 and some aircraft operated under part 135.) Mode S transponders transmit both aircraft altitude and aircraft identification information. Both Mode A/C transponders and Mode S transponders require interrogation to provide information.

To accommodate the projected level of traffic without increasing delay, more comprehensive surveillance in the NAS, including more radar sites in certain areas, would be necessary. Even if more radar sites were commissioned, however, there are many areas in which radar coverage is not feasible, either geographically (e.g., mountainous areas) or in a cost-effective manner (e.g., remote areas). Furthermore, simply increasing the number of radars in the NAS does not solve the inherent limitation of radar technology, and would not allow the FAA to reduce current separation standards.[5] Consequently, the future of air traffic surveillance cannot be based solely on the use of radar. Radar technology also lacks the capability to provide services on the flight deck. However, the FAA is planning to maintain its current network of primary radars, and expects to be able to reduce a percentage of its secondary radars. This NPRM does not propose to reduce primary radar sites.[6]

[1] The Plan was submitted to Congress on December 12, 2004.

[2] A copy of the Plan has been placed in the docket for this rulemaking.

[3] Very light jets may revolutionize the industry by permitting more individuals and corporations to own aircraft. It addition, many airports that are too small for large jet operations should benefit because they can support very light jets.

[4] An aircraft without an operating transponder may still be observed by ATC using primary radar, but the aircraft will not have an identifying tag.

[5] The FAA currently separates aircraft by 5 NM in the en route environment and 3 NM in the terminal environment.

[6] While the FAA expects to be able to reduce a significant percentage of the national secondary surveillance radar infrastructure, primary radars will not be decommissioned as a function of this proposal. Primary radar will serve a role in

Instead, this NPRM would transfer future aircraft surveillance to newer and more advanced onboard avionics that provide more accurate and timely aircraft information. ADS–B has been identified as the technology to facilitate that goal.

II. The ADS–B System

A. General

The ADS–B system is an advanced surveillance technology that combines a satellite positioning service, aircraft avionics, and ground infrastructure to enable more accurate transmission of information between aircraft and ATC. The system enables equipped aircraft to continually broadcast information, such as identification, current position, altitude, and velocity. ADS–B uses information from a position service, e.g. Global Positioning System (GPS), to broadcast the aircraft's location, thereby making this information more timely and accurate than the information provided by the conventional radar system (which has a latency factor since it is based on interrogation and reply). ADS–B also can provide the platform for aircraft to receive various types of information, including ADS–B transmissions from other equipped aircraft or vehicles. ADS–B is automatic because no external interrogation is required, but is ''dependent'' because it relies on onboard position sources and onboard broadcast transmission systems to provide surveillance information to ATC and ultimately to other users.

Implementation of an ADS–B system would not completely replace the primary radar or SSR at this time. In addition, ADS–B does not replace the requirement for transponders. Transponders are still necessary for SSR, which is the FAA's backup strategy in case of ADS–B failure. For more information on the backup strategy, see section IV.C.4, Backup Surveillance Strategy.

The performance requirements for ADS–B avionics proposed in this NPRM would ensure that the aircraft is broadcasting the requisite information with the degree of accuracy and integrity necessary for ATC to use that information for surveillance.[7] This enhanced surveillance would provide ATC with the enhanced ability to surveil and separate aircraft so that efficiency and capacity could increase beyond current levels to meet the predicted demand for ATC services while continually maintaining safety. Incremental developments in capacity, efficiency, and air traffic control procedures based on radar technology cannot accommodate the anticipated increase in demand for surveillance and separation services, which could result in delays that would far exceed those experienced today. Without ADS–B, the increase in demand could result in increased congestion and the denial of ATC service to some users of the NAS.

ADS–B technology already has been demonstrated successfully in Alaska via the Capstone program.[8] In Alaska, radar coverage is either very limited or non-existent. ADS–B provides a level of surveillance performance that previously did not exist and has resulted in increases in both efficiency and capacity.

''ADS–B Out'' refers to an appropriately equipped aircraft's broadcasting of various aircraft information. ''ADS–B In'' refers to an appropriately equipped aircraft's ability to receive another aircraft's ADS–B Out information. This proposal only seeks to require ADS–B Out; the FAA is not proposing to require ADS–B In at this time.[9]

B. Ground Infrastructure

Implementing ADS–B in the NAS to provide surveillance requires avionics, ground infrastructure, automation, and data. This NPRM addresses the performance requirements for the avionics and the necessary data that must be broadcast from the aircraft in order for ATC to use that information for surveillance and separation. The ground infrastructure involves the installation of a multitude of ground stations throughout the NAS that first receive the ADS–B Out transmissions from an aircraft, then relay real-time information based on those transmissions to ATC facilities. The exact number of ground stations needed to provide broadcast services across the NAS will be negotiated as part of the national broadcast service contract. The preliminary estimate approved by the FAA's Joint Resource Council call for 548 ground stations to provide coverage NAS-wide and in the Gulf of Mexico.

On August 30, 2007, the FAA awarded a performance-based service contract to a consortium led by ITT Corporation. The contract is to provide ADS–B surveillance uplink (ground-to-air) and downlink (air-to-ground) services and Automatic Dependent Surveillance Rebroadcast (ADS–R), Traffic Information Services—Broadcast (TIS–B) [10], and Flight Information Services—Broadcast (FIS–B) [11] services. The vendor will install and maintain the ground equipment necessary to provide ADS–B uplink and downlink services to ATC. On November, 30, 2006, the FAA issued a Screening Information Request to determine which vendors understand the contract requirements well enough to proceed in the acquisition process. The FAA's schedule for ADS–B Out calls for all ground infrastructure, including the provision of broadcast services, to be in place and available where current surveillance exists by the end of fiscal year 2013. This schedule will provide reasonably ample time for operators to equip their aircraft for ADS–B Out and meet the proposed compliance date of 2020 in this notice.

III. Summary of the Proposal

The FAA is proposing ADS–B Out performance requirements for all aircraft operations in Class A, B, and C airspace areas in the NAS, and Class E airspace areas at or above 10,000 feet mean sea level (MSL) over the 48 contiguous United States and the District of Columbia. This proposal also would require that aircraft meet these performance requirements in the airspace out to 30 nautical miles (NM), from the surface up to 10,000 MSL, around certain identified airports that are among the nation's busiest. In addition, this proposal if adopted would require that aircraft meet ADS–B Out performance requirements to operate in

surveillance during the transition period of ADS–B avionics equipage.

[7] An aircraft equipped for ADS–B Out would transmit the aircraft's position, velocity and other specified, proposed message elements once per second. Radar data, on the other hand, is generated approximately once every 3–12 seconds for display to the air traffic controller depending on whether the aircraft is in the en route or terminal environment.

[8] For additional information on Capstone, see Section VI. later in the preamble. It should be noted that Special Federal Aviation Regulation No. 97, Special Operating Rules for the Conduct of Instrument Flight Rules (IFR) Area Navigation (RNAV) Operations Using Global Positioning Systems (GPS) in Alaska (68 FR 14072; March 21, 2003), would remain in effect to supplement the requirements in this proposal as it applies to Alaska.

[9] See Sections IV. later in the preamble for a detailed discussion of ADS–B Out and V. for a detailed discussion of ADS–B In.

[10] Traffic Information Services—Broadcast (TIS–B) is a ground-based uplink report to a pilot of proximate traffic that is under surveillance by ATC but is not ADS–B-equipped. This service would be available even with limited ADS–B implementation. The combinations of the surveillance and TIS–B services can enable pilots to have enhanced visual acquisition of other aircraft. Having traffic and other flight obstacles on a cockpit display will enable pilots to more quickly identify safety hazards and communicate with ATC if necessary. Aircraft that are equipped with ADS–B can be monitored through a direct reception of their ADS–B signals in an air-to-air environment.

[11] Flight Information Services—Broadcast (FIS–B) is a ground-based uplink of flight information services and weather data. Other flight information provided by the FIS–B service includes Notices to Airmen and Temporary Flight Restrictions.

Class E airspace over the Gulf of Mexico from the coastline of the United States out to 12 nautical miles (NM), at and above 3,000 feet MSL.

The FAA proposes to require aircraft flying at or above Flight Level 240 (FL240) to have ADS–B Out performance capabilities using the 1090 Extended Squitter (1090ES) broadcast link. Aircraft flying in the designated airspace below FL 240 would have to use either the 1090ES or Universal Access Transceiver (UAT) broadcast link. These proposals would affect all U.S. commercial air carrier operations, foreign-flag carriers operating in the designated classes of U.S. airspace, air charter operations, air cargo operations, and a significant portion of the general aviation fleet operating in the NAS.

The implementation of ADS–B requires two datalinks to support the full set of applications. UAT is intended to support applications for the general aviation user community that are not needed by air carriers because air carriers have weather radar, fly at high altitudes, and have other aeronautical links. UAT-equipped general aviation aircraft are not generally equipped with weather radar and would be flying at low altitudes. The 1090ES link is the internationally agreed upon link for ADS–B, and is intended to support applications for air carriers and other high-performance aircraft. The 1090ES broadcast link does not support applications available from FIS–B, like weather and related flight information. This is because of the bandwidth limitations of the 1090ES link for transmitting the large message structures required by FIS–B. Weather and flight information for 1090ES-equipped aircraft is generally provided by commercial products.

As described in the Plan, large increases in air traffic would result in mounting delays or limitations in service for many areas if the current surveillance system is not modified. An environment in which aircraft meet the proposed ADS–B Out performance requirements would result in greater capacity and efficiency in the NAS, maintain safety, and provide a flexible, expandable platform to accommodate future traffic growth while avoiding possible system delays and limitations in service.

In moving forward with a performance-based surveillance system, the FAA believes that communication with the affected industry is critical. The FAA hosted several Industry Days to brief the technology, the rulemaking and procurement processes and associated milestones to interested parties, including manufacturers and affected operators. As with any rulemaking, the FAA invites comments on the various elements of this proposal, and all comments will be carefully considered. If this proposal is adopted as a final rule, it may be modified in view of the submitted comments.

IV. The Proposal for ADS–B Out

A. Advantages of ADS–B Out

ADS–B Out, as proposed in this notice, would enhance surveillance and broadcast services in both the en route and terminal environments and provide ATC with more accurate information to safely separate aircraft in the air.

In today's radar surveillance environment, accuracy and integrity of radar information is a function of range and decreases as the distance between the radar antenna and the aircraft increases. Unlike radar, both the accuracy and integrity of ADS–B Out is uniform and consistent throughout the service area. A comprehensive, national surveillance system that utilizes ADS–B Out would provide ATC with the ability to accurately identify and locate aircraft that are either far away from the ATC facilities or at the outer boundaries of ground station service volume.

If ATC had more precise aircraft position information, it could position, separate, and provide speed and direction instructions to aircraft with improved precision and timing. This would result in the use of optimal flight paths and altitudes. This transmission of information would enable improvement of airspace capacity throughout the NAS. Additionally, with ADS–B Out, ATC would receive updated information broadcast by aircraft more frequently than with radar, and would be able to track a more closely monitored flight path. This would result in ATC providing fewer instructions to pilots, thus having more time to accommodate additional aircraft within the allotted airspace. These improved efficiencies for ATC ultimately should accommodate the increased number of aircraft able to operate in the NAS. In addition, we expect a reduction in aircraft fuel burn because better surveillance provides for more efficient use of the airspace, provides for optimal aircraft routing, and addresses the limits currently experienced with radar.

In the terminal radar environment today, ATC may have to request pilots to provide aircraft speed, heading, and in some cases, aircraft identification. Neither the primary radar nor SSR systems provide all that information. With ADS–B, ATC is automatically provided aircraft speed, heading, and other identifying information, including aircraft size, which are necessary to safely position and separate aircraft more rapidly than is possible today.

While more precise ADS–B derived aircraft position information improves ATC efficiencies under current separation standards, the potential for significantly greater capacity and efficiency gains may be realized by reducing separation standards between aircraft. Therefore, this rulemaking is expected to help achieve a level of surveillance accuracy that would support reducing aircraft separation standards. ADS–B is an essential component of the NextGen platform and is necessary to achieve a level of capacity in the NAS commensurate with future growth.

B. Avionics

This discussion first addresses the broadcast message links necessary to transmit aircraft information to the ground stations and the specific message elements that would be broadcast by the aircraft comprising the ADS–B Out transmission. Next we discuss the navigation position sensor and the necessary accuracy and integrity of the ADS–B message. Finally, we explain the necessary requirements for antenna diversity on the aircraft, and the required latency of the data in the ADS–B transmission from the aircraft.

1. 1090ES and UAT Broadcast Links

In 2002, the United States determined that two frequencies would be appropriate for ADS–B: 1090MHz and 978MHz. To broadcast the necessary data elements for ADS–B Out transmission under this proposal, aircraft would have to be equipped with either 1090ES or UAT that meet the latest version of either Technical Standard Order (TSO)–C166a or TSO–C154b, respectively.[12] Today, operators of air carriers and many private/commercial aircraft already are primarily equipped with avionics designed under TSO–C112, Air Traffic Control Radar Beacon System/Mode Select (ATCRBS/Mode S), which are required to function with the Traffic Alert and Collision Avoidance System

[12] A TSO is a minimum performance standard issued by the Administrator for specified materials, parts, processes, and appliances used on civil aircraft. TSO–C166a sets the minimum performance standards for Extended Squitter Automatic Dependent Surveillance—Broadcast (ADS–B) and Traffic Information Service Broadcast (TIS–B) Equipment Operating on the Radio Frequency of 1090 MHz. TSO–C154b sets the minimum performance standard for Universal Access Transceiver (UAT) Automatic Dependent Surveillance— Broadcast (ADS–B) Equipment.

(TCAS II) or ACAS.[13] Many TSO–C112 Mode S Transponders can be modified or are designed to provide 1090ES functionality under TSO–C166a. Most other general aviation aircraft, typically small aircraft operated in non-commercial service (that are not required to have TCAS II), would likely use the UAT broadcast link for ADS–B Out, which operates on the 978MHz frequency. Today, a small number of aircraft are equipped with UAT ADS–B In and are capable of receiving TIS–B and FIS–B services. While the 1090ES link does not support FIS–B, it does support TIS–B.

In December 2006, RTCA [14] published RTCA/DO–260A, Change 2, ''Minimum Operational Performance Standards (MOPS) for 1090 MHz Automatic Dependent Surveillance—Broadcast (ADS–B).'' This change revised RTCA/ DO–260 1090ES MOPS. The major differences between RTCA/DO–260 and RTCA/ DO–260A are refinements of the Navigation Integrity Category (NIC), Navigation Accuracy Category (NAC), and Surveillance Integrity Level (SIL) parameters, which significantly improve the overall performance and interoperability of the ADS–B Out broadcast link. These modified parameters (NIC, NAC, and SIL) provide a level of accuracy and integrity with respect to the information transmitted in the ADS–B Out message that would enable ATC to provide improved surveillance and separation services based on the information it receives from the aircraft.

After RTCA issued its updates in December 2006, the FAA subsequently issued TSO–C166a, which adopted the recent modifications specified in change 2 to RTCA/DO–260A, and characterizes the parameters of NIC, NAC, and SIL.[15] There are some aircraft equipped today with legacy 1090ES ADS–B systems. Operators of these aircraft would need to modify their broadcast link equipment to meet the proposed requirements defined in TSO–C166a. This modification could include hardware, software, or both depending upon other avionics installed on the aircraft.

The transition to TSO–C166a and TSO–C154b has been identified as a requirement for use of ADS–B in the required airspace. The United States faces unique challenges in air traffic control due to its high density airspace and stringent safety requirements. In order to maintain safety and capacity, given a state of increased air traffic, advanced surveillance technologies will be necessary. The earlier standards in RTCA/DO–260 do not provide the performance standards necessary to meet the requirements of the NAS. RTCA/DO–260a provides a means to transmit the Secondary Surveillance Radar beacon codes that currently service the NAS and will continue to be required as a backup to ADS–B. RTCA/ DO–260 does not provide that compatibility.

The International Civil Aviation Organization (ICAO) is in the process of updating the 1090ES Standards and Recommended Practices (SARPs) published in ICAO Annex 10, Amendment 77, to include those requirements identified in the publication of RTCA/DO–260A, Change 2. These updated SARPs are expected to become effective in November 2007.

Operators may, under this proposal, also choose to equip with dual link avionics, i.e. 1090ES and UAT, which would provide the capability to transmit and receive information on both broadcast links at the same time.

If an aircraft is to operate at or above FL240, which is discussed further in section IV.b.3. of this preamble (''Broadcast Link Requirements for Different Flight Levels''), the aircraft's broadcast link capabilities would have to meet the minimum performance requirements of TSO–C166a, (i.e., be equipped with 1090ES). Consequently, those aircraft operating at or above FL240 with Mode A/C transponders would need new transponders. Aircraft with Mode S transponders without compatible extended squitter capability installed would need to be reequipped with those providing 1090ES functionality, or supplement them with 1090ES to operate at or above FL240.

In December 2006, RTCA also issued RTCA/DO–282A, Change 1 for UAT, which clarified the definitions of the NIC, NAC, and SIL similar to those specified for 1090ES discussed above. TSO–C154b adopted the requirements of RTCA/DO–282A and clarifies performance parameters capable of ensuring interoperability with ground stations deployed to support the Capstone program in Alaska, and to provide for future NAS interoperability assurances. Aircraft equipped with UAT must meet the minimum performance standards in TSO–C154b, or later version. There are very few aircraft equipped with legacy UAT equipment. Operators of those aircraft would need to modify their equipment to meet the performance standards of TSO–C154b.

2. Broadcast Link Requirements for Different Flight Levels

The FAA proposes to require that aircraft flying at or above FL240 have ADS–B Out performance capability using the 1090ES broadcast link. For operations below FL240, operators could equip their aircraft with either the 1090ES or UAT broadcast links. Some general aviation aircraft are already equipped with the UAT broadcast link, and most general aviation operators are expected to equip with UAT under this proposal in order to have TIS–B and FIS–B services. Larger aircraft, particularly the transport category aircraft, generally operate at higher altitudes and are already equipped with 1090ES that meets TSO–C166 (which would require modification to upgrade to TSO–C166a under this proposal) or have equipment installed that uses the 1090 broadcast link. Furthermore, the international aviation communities, and for the most part, foreign-flag aircraft operating in the U.S., tend to operate large transport category aircraft that also operate at the higher altitudes. Having a single broadcast link at higher altitudes would enable aircraft equipped for ADS–B In to benefit from potential future applications such as aircraft merging and spacing, and self-separation. These applications are enabled by having aircraft identify each other on the same data link without the need to employ ADS–R, which would increase the latency of the transmission. The FAA believes that the approach articulated in the proposal to require 1090ES for operations at and above FL240 is largely consistent with how those affected operators would choose their respective broadcast link. While this NPRM does not require equipage for ADS–B In, we fully recognize that operators may choose to equip for that capability and that it is reasonable to lay the foundation so that operators may be able to take advantage of future applications if they so choose.

3. Part 91 Appendix H—Broadcast Message Elements

The FAA is proposing to add an appendix to 14 CFR part 91 to specify the broadcast message elements necessary for ADS–B Out. These message elements contain the data necessary for ATC to support aircraft

[13] Airborne Collision Avoidance System (ACAS) is comparable to TCAS II and is specified for use in Europe.

[14] RTCA, Incorporated is a not-for-profit corporation formed to advance the art and science of aviation and aviation electronic systems for the benefit of the public. The organization functions as a Federal Advisory Committee and develops consensus-based recommendations on contemporary aviation issues. The organization's recommendations are often used as the basis for government and private sector decisions as well as the foundation for many TSOs.

[15] TSO–C166a superseded TSO–C166.

surveillance by ADS–B. The message elements required support future NextGen air-to-air applications such as reduced horizontal separation and self separation. These message elements also support the capability for aircraft avionics to be verified during normal operations for continuing airworthiness in lieu of conducting ground checks of the avionics. We believe the message elements allow for further NextGen capabilities, at least to the extent we can predict those future needs at this time. However, in the future, additional elements such as predictive aircraft movement could be added to enable further capabilities.

These elements would be broadcast automatically from the aircraft except where pilot entry is necessary. Pilot entry would be necessary for elements (g) through (k). The following is a description of each message element.

(a) *The length and width of the aircraft.* This message element would provide ATC with quick reference to the aircraft's dimensions. On airport surfaces in particular, aircraft are in close proximity to each other and this information would facilitate ATC's ability to use the most appropriate landing and surface movement procedures for individual aircraft in managing traffic on the airport surfaces. This information would be pre-set when avionics equipment meeting the standards in TSO–C166a or TSO–C154b, as applicable, is installed on the aircraft.

(b) *An indication of the aircraft's lateral and longitudinal position.* This message element is derived from the aircraft's navigation position sensor [16] and would provide an accurate position based on latitude, longitude, and accuracy values for the display of information in a format that meets ATC requirements. This information is critical to the safe and efficient separation of aircraft.

(c) *An indication of the aircraft's barometric pressure altitude.* This message element would provide ATC with the aircraft's altitude information. Currently, § 91.217 requires Mode C and Mode S transponders to transmit pressure altitude. It is critical that the altitude transmitted by the Mode C and Mode S transponders is identical to that in the ADS–B transmission. Therefore, in addition to this proposed data element, we believe that § 91.217 should be amended as well. Section 91.217 requires Mode C and Mode S transponders to transmit pressure altitude. We propose to revise § 91.217 to also apply to the ADS–B transmission of altitude to ensure that the reported altitude from various avionics is consistent.

(d) *An indication of the aircraft's velocity.* This message element is also derived from the aircraft's navigation position sensor and would provide ATC with the aircraft's airspeed with a clearly stated direction and describes the rate at which an aircraft changes its position.

(e) *An indication if TCAS II or ACAS is installed and operating in a mode that may generate resolution advisory alerts.* This information would identify to ATC whether an aircraft is equipped with TCAS II or a later version or its European equivalent ACAS, and whether that equipment is operating in a mode that may generate resolution advisory alerts.

(f) *For aircraft with an operable TCAS II or ACAS, an indication if a resolution advisory is in progress.* Both TCAS II and ACAS improve safety by detecting impending airborne collisions or incursions and issuing commands to the pilot on how to avoid the hazard by climbing or descending. If two aircraft get too close to each other, the aircrafts' TCAS II or ACAS systems will provide a resolution advisory (RA), which gives the pilots a command to climb or descend to avoid the other aircraft. The RA command is provided independent of ATC instructions. It is critical for ATC to know why an aircraft is climbing or descending, i.e., responding to an RA, ATC instruction, or a previous flight plan path. ATC may respond more efficiently and safely in managing the air traffic environment by knowing whether an aircraft is responding to an RA.

(g) *An indication if ATC services are requested.* (*Requires flight crew entry.*) This message element would identify to air traffic controllers if services are requested and whether the aircraft is in fact receiving ATC services.

(h) *An indication of the Mode 3/A transponder code specified by ATC. (Requires flight crew entry.)* All transponder-equipped aircraft on Instrument Flight Rules (IFR) flights are directed by ATC to ''squawk'' a unique four-digit code, commonly referred to as a ''Mode 3/A transponder code.'' All transponder equipped aircraft on Visual Flight Rules (VFR) flights are directed by ATC to squawk 1200. The assigned Mode 3/A transponder code is used by ATC to identify each aircraft operating under IFR, and the 1200 transponder code identifies aircraft operating under VFR.

An aircraft equipped with ADS–B Out continually broadcasts its state vector (3-dimensional position and 3-dimensional velocity). It is critical for ATC to correlate and verify that the ADS–B Out information transmitted from each aircraft is displayed and identified correctly on the ATC radar display. Therefore, it is imperative that the ATC-assigned transponder code be identical to the assigned transponder code in the ADS–B Out message. If the aircraft's avionics are not capable of allowing a single point of entry for the transponder and ADS–B Out Mode 3A code, the pilot would have to ensure that conflicting codes are not transmitted to ATC. Operational procedures would have to be developed, including specific guidance, instructions, or training material provided by the equipment manufacturer, as well as the operator training programs, manuals, Operations Specifications, and Letters of Authorization, to ensure that conflicting codes are not transmitted to ATC.

(i) *An indication of the aircraft's call sign that is submitted on the flight plan, or the aircraft's registration number. (Aircraft call sign requires flight crew entry.)* This message element would correlate flight plan information with the data that ATC views on the radar display and facilitate ATC communication with the aircraft. The aircraft's call sign or registration number broadcast in the ADS–B message would have to be identical to information contained in its flight plan.

(j) *An indication if the flight crew has identified an emergency, and if so, the emergency status being transmitted.* (*Requires flight crew entry.*) This message element would alert ATC that the aircraft is experiencing emergency conditions and indicate the type of emergency. Applicable emergency codes would be found in the Aeronautical Information Manual. This information would alert ATC to potential danger to the aircraft so it could take appropriate action.

(k) *An indication of the aircraft's ''IDENT'' to ATC. (Requires flight crew entry.)* ATC may request an aircraft to ''IDENT,'' to aid controllers to quickly identify a specific aircraft. The pilot manually inputs the aircraft's identity, which then highlights the aircraft on the ATC scope. When activated, this message element allows identification of the aircraft with which ATC is in communication.

(l) *An indication of the aircraft's assigned ICAO 24-bit address.* ICAO 24-bit codes are unique and assigned to each individual aircraft. These codes are necessary for aircraft used for international operations. This code would provide the FAA with the future capability to identify aircraft using the

[16] The aircraft's navigation position sensor is discussed in detail in section IV.4. of this preamble.

ICAO 24-bit address. This capability addresses limits on future capacity due to the finite number of aircraft that can be tracked with discrete transponder codes.

(m) *An indication of the emitter category.* If ATC knows the emitter category, it can determine separation minima based in part on a particular aircraft's wake vortex. This information would be used to provide air traffic controllers and ground crews with more efficient information regarding a particular aircraft's constraints and capabilities. Once the emitter category is set at installation, it would not change. (Refer to TSO–C166a or TSO–C154b for additional information.) Some examples of emitter categories to be used (as specified in RTCA DO–260A, DO–242A, and DO–282A) include, but are not limited to, the following:

- Light (ICAO)—7,000 kg (15,500 lbs) or less.
- Small aircraft—7,000 kg to 34,000 kg (15,500 lbs to 75,000 lbs).
- Large aircraft—34,000 kg to 136,000 kg (75,000 lbs to 300,00 lbs).
- High vortex large (i.e., B–757).
- Heavy aircraft (ICAO)—136,000 kg (300,000 lbs) or more.
- Rotorcraft.

(n) *An indication whether a cockpit display of traffic information (CDTI) is installed and operable.* This message element would alert ATC as to whether an aircraft has an operable CDTI [17] installed. A CDTI is necessary for aircraft to have ADS–B In capability. This message element would indicate to ATC which aircraft are capable of receiving ADS–B In services.

(o) *An indication of the aircraft's geometric altitude.* The geometric altitude is a measure of altitude provided by a satellite-based position service, determined mathematically, based on a three-dimensional position in space. This message element is necessary to confirm accuracy or discrepancies between geometric and barometric altitude, which changes as a function of air pressure in the environment. The message element would serve as a tool for validating positioning services.

[17] CDTI is the function of presenting surveillance traffic information (e.g., airborne or surface) to the flight crew. To display traffic, the CDTI may use a dedicated display or a shared multi-function display (MFD) device. The CDTI is capable of displaying position information for nearby aircraft and ADS–B-equipped airport surface vehicles. The CDTI consolidates ADS–B traffic targets, terrain, weather, and other products relative to the pilot's own aircraft or flight operation. It allows pilots to display textual and graphical information provided by the ADS–B System and Broadcast Services.

4. Navigation Position Sensor and the Accuracy and Integrity of the ADS–B Message

ADS–B Out continuously transmits aircraft information through the selected broadcast data links of 1090ES or UAT. The aircraft's lateral and longitudinal position and velocity are proposed data elements transmitted in the broadcast message. The navigation position sensor is equipment onboard the aircraft that computes a geodetic position (latitude and longitude) that can be a separate sensor or integrated into other navigation equipment or system onboard the aircraft. (Examples of such equipment are LORAN C, GPS, GPS–WAAS, DME/DME and Inertial Reference Unit (IRU).)

The accuracy and integrity of these broadcast message elements transmitted from the aircraft to the ground stations depends on the aircraft's navigation position sensor and the signal source from which the position is derived. The accuracy and integrity of the transmitted aircraft position and velocity are critical for use in surveillance and various airborne and surface applications. The accuracy and integrity of transmitted information expressed by ADS–B avionics is measured by the Navigation Accuracy Category for Position (NACp), the Navigation Accuracy Category for Velocity (NACv), the NIC and the SIL.

An aircraft transmitting its position and velocity with the accuracy and integrity proposed in part 91, Appendix H, Section 3 (ADS–B Out Performance Requirements for NIC, NAC, and SIL) would be more accurately identified by ATC than it would be in today's radar environment. The confidence with respect to the accuracy of the position and velocity reported by ADS–B Out would enable the future applications discussed further in this proposal that simply could not be provided by existing surveillance systems. While existing surveillance systems provide information that is sufficient for separation purposes and the capacity needs of today's traffic environment, a more responsive and versatile ATC system will need improved accuracy and integrity of broadcast information for future surveillance performance. The values proposed would ensure that the information ATC receives has the level of performance and the requisite confidence in the accuracy of that information necessary to control aircraft. Increasing the quality and standards for surveillance information presents new opportunities for efficiency and capacity improvements in the NAS, and the potential for future self-separation or air-to-air applications of ADS–B.

The NACp specifies the accuracy of the aircraft's horizontal position information (latitude and longitude) and the vertical geometric position transmitted from the aircraft's avionics. All aircraft position information has a margin of error and the accuracy category specifies that margin. The NACp specifies with 95 percent probability that the reported information is correct within an associated allowance. (The horizontal 95% bound error allowance resembles an imaginary circle around the aircraft with a radius equivalent to the NACp defined value.) ATC and aircraft equipped for ADS–B In would monitor the NACp reporting to ensure that the accuracy supports the intended operational use. Not all navigation position sensors are capable of providing the necessary aircraft information with the accuracy and integrity needed to support certain surveillance applications.[18] In order to use ADS–B Out for surveillance and separation, the NACp value must have a small margin of error in position reporting.

In today's radar surveillance environment, aircraft position accuracy is required to be within 0.3 NM for operations in the en route airspace, and 0.1 NM for operations within terminal area airspace. An aircraft broadcasting its position with a NACp equal to or greater than 7 would provide a horizontal position accuracy of at least 0.1 NM with no specific requirement for vertical (geometric) position accuracy. Aircraft position reported at a NACp equal to or greater than 7 would meet the minimum radar accuracy requirement for terminal area operations and exceed radar performance for en route operations. Therefore, the FAA believes that the minimum accuracy requirement necessary to maintain an equivalent level of surveillance in the terminal airspace area (and provide for equivalent separation as that in today's radar environment) would be a NACp of 7. The FAA is not, however, engaging in this rulemaking simply to meet the level of surveillance that exists in the current infrastructure, or to establish a new surveillance system that would only enable separation performance equivalent to that realized today. ADS–B performance is intended to go beyond today's standards for accuracy and provide a platform for NextGen. In order to accomplish that goal, we propose a minimum accuracy value of NACp 9 in

[18] Surveillance applications are discussed further in Section V of this NPRM.

all airspace areas that ADS–B would be required. This proposed accuracy requirement would provide horizontal position information for ADS–B Out equipped aircraft to within 30 meters (0.016NM) horizontally and vertical (geometric) position accuracy to within 45 meters. This proposed accuracy requirement could make it possible for future airspace separation to be reduced from today's current separation minima. At this time the FAA cannot determine the extent to which separation standards might be reduced. Significant testing and certification is required before any reduction in separation standards might be applied. The FAA may examine the possible reduction of separation standards once ADS–B has been certified to meet existing separation standards safely and consistently.

Under this proposal, any aircraft not operating with at least this level of performance would not be permitted in the designated airspace without first obtaining authorization from ATC. If the aircraft broadcast message element for position has an NACp of less than 9, ATC would be notified and it could choose to revert to a backup system or apply procedural mitigation.

This proposed NACp of 9 would also provide the necessary accuracy to enable certain applications on the surface at the nation's busiest airports. For various operational applications including situational awareness and traffic alerting, it would be necessary for aircraft position accuracy to be transmitted with an error of 30 meters or less horizontally, particularly for surface operations. The proposed requirement for an NACp equal to or better than 9 would meet the 30 meter or less performance requirement for surface operations and would apply to all aircraft equipped with ADS–B Out. If the aircraft broadcast message element for position has an NACp of less than 9, ATC and aircraft equipped with ADS–B In would be automatically notified that the ADS–B Out performance for a particular aircraft is degraded and therefore, the information is unusable to support either situational awareness on the surface or awareness of runway occupancy on approach to airports. The NACp values are specified in greater detail in RTCA/DO–260A and RTCA/DO–282A, which are recognized performance standards by the applicable TSOs identified under this proposal.

The NACv is a measured value similar to the NACp value except that it applies to the computed velocity derived from navigation position sensor or navigation system. In accordance with TSO–C166a and TSO–C154b, which recognize the performance standards of DO–260A and DO–282A respectively, the NACv must be greater than or equal to 1. This means that the estimate of aircraft velocity must be accurate to within 10 meters per second and must be reported with 95 percent probability.

NIC differs from NAC in that a NIC value specifies aircraft integrity containment often referred to as the ''containment radius,'' which is the maximum error for the broadcast position as described in RTCA/DO–260A, Change 2 and DO–282A, Change 1. NIC and NAC performance values will vary depending upon the positioning service and navigation position sensor. NIC/NAC values may be enhanced or degraded by external NAS infrastructure or by characteristics of avionics systems performance. For instance, a GPS outage would interrupt the integrity and accuracy of the broadcast information. Avionics failures also could degrade expected performance. The NIC value is broadcast so that surveillance services may determine whether the horizontal and vertical (geometric) position meets an acceptable level of integrity containment for the intended operation or phase of flight. For ADS–B Out, the FAA proposes a NIC value of 7. This value would bound the error to within 0.2 NM. The NIC parameter combined with the SIL parameter described in the next paragraph provides integrity assurance in broadcast position.

The SIL specifies the ADS–B Out avionics integrity level and the probability that the position error may be larger than the reported NIC. The SIL may be configured at the time of installation. SIL is typically based on the design assurance level [19] of the ADS–B Out avionics and its navigation position sensor. While a NIC value varies based on computed navigation sensor position, SIL is typically a static (unchanging) value for the ADS–B Out avionics. For example, while the NIC is dependent on the satellite constellation (or number of available satellites), the SIL's reporting of the installed ADS–B avionics is not dependent upon the satellite constellation and would not be affected by changes in the number of available satellites being used in the derived position. To achieve performance at least equivalent to existing radar systems, the FAA proposes a SIL of 2 or better. This value would provide integrity assurance that meets a failure rate probability of 99.999 per flight hour.

The proposed NIC, NACp, NACv, and SIL requirements would support not only ATC services, but also advisory applications for those who choose to equip aircraft with ADS–B In. The proposed values for accuracy and integrity would meet the needs of all the ADS–B In applications discussed in this proposal. Terminal area and surface applications such as Final Approach and Runway Occupancy Awareness would not be enabled unless all aircraft in the surface environment report their position accurately on runways and taxiways (NACp equal to or greater than 9). Universal compliance with accuracy and integrity requirements would ensure that ADS–B In applications could provide accurate data even in a closely spaced environment such as an airport surface.

This proposal specifies performance standards for aircraft avionics equipment for operation to enable ADS–B Out. These performance standards would accommodate and facilitate the use of new technology. Presently, GPS augmented by the Wide Area Augmentation System (WAAS) is the only navigation position service that provides the level of accuracy and integrity (NIC, NACp, and NACv) to enable ADS–B Out to be used for NAS-based surveillance operations with sufficient availability. The FAA is considering whether other navigation position systems such as the Global Navigation Satellite System (GNSS) combined with tightly coupled inertial navigation systems are also capable of meeting the proposed performance standards. Other types of positioning systems that meet the requisite performance requirements may be developed in the future, and may include satellite constellations similar to the Galileo system, or tightly coupled IRU to existing GPS. At this point, however, the agency is still studying the ability of these other navigation position systems to meet the performance standards articulated in this proposal.

In order to meet the proposed performance requirements using the GPS/WAAS system, aircraft would be required to have equipment installed onboard the aircraft that meets one of the following: (1) TSO–C145b, Airborne Navigation Sensors using the GPS augmented by WAAS; or (2) TSO–C146b Stand-Alone Airborne Navigation

[19] ADS–B Out avionics design assurance is dependent on both the hardware and software levels. There are 5 hardware design assurance failure classifications; (1) Catastrophic, (2) Hazardous/Severe-Major, (3) Major, (4) Minor, and (5) No Safety Effect. RTCA/DO–178B ''Software Considerations in Airborne Systems and Equipment Certification'' software classifications are; (1) Level A, (2) Level B, (3) Level C, (4) Level D, and (5) Level E which directly map to the hardware design assurance failure classifications. The minimum requirement for systems development assurance for ADS–B Out is a hardware design assurance (failure classification) of ''major'' dependent upon RTCA/DO–178B Level ''C'' software.

Equipment using the GPS augmented by WAAS.

5. ADS–B Aircraft Antenna Diversity and Transmit Power Requirements

The aircraft antenna is an important part of the overall ADS–B Out system because antennas are major contributors to the system link performance. The location, number of antennas and transmit power required for the airborne ADS–B Out system is a function of the equipment class for the selected broadcast link (UAT or 1090ES). This proposal specifies the classes of 1090ES and UAT equipment that would meet the performance standards for ADS–B Out. The equipment classes include requirements for aircraft antenna diversity and transmit power, as explained below.

Optimal link performance requires both a top and bottom antenna (antenna diversity). Accordingly, the agency is proposing to require that the aircraft be equipped with both a top and bottom antenna to support ADS–B Out applications as well as future air-to-air ADS–B In applications. Antenna diversity is a requirement of the equipment classes identified in the proposed rule.

For aircraft already equipped with a Mode S transponder (TSO–C112), which incorporates antenna diversity, no additional antennas would be required for ADS–B Out using 1090ES. For ADS–B In, however, additional 1090 MHz receive antennas may be necessary depending on the additional avionics equipment installed on the aircraft. It may be possible to share the TCAS 1090 MHz receiver, as long as it can be shown that TCAS performance is not degraded. This shared approach is addressed in TSO–C166a.

For ADS–B installations using UAT, it may be possible to share the aircraft's existing bottom ATCRBS transponder (TSO–C74c) antenna through the use of an antenna diplexer, thus only requiring installation of a top antenna. Specifications for the diplexer are addressed in TSO–C154b. This dual antenna system would not result in degraded performance relative to that which would have been produced by a single system having a bottom-mounted antenna.

Antennas would also have to transmit their signal at a certain level of power in order to ensure that transmitted signals are received by ground stations, and by ADS–B In equipped aircraft and vehicles. The UAT requires a 16 watt minimum transmit power. Therefore, aircraft equipped with the UAT would be required to have Class A1H, A2, A3, or B1 equipment, as defined in TSO–C154b. The 1090ES broadcast link requires a 125 watt minimum transmit power. Correspondingly, aircraft operating with 1090ES would also be required to have Class A1, A2, A3 or B1 equipment, as defined in TSO–C166a. The transmitted power level supports the coverage requirements for each equipment class, including the impact of loss of antenna system performance.

These proposed antenna requirements are necessary so that receivers of the ADS–B system on the ground and in other aircraft could receive ADS–B Out messages with sufficient strength, consistency, and update rate to provide the necessary information for surveillance and broadcast services.

6. Latency of the ADS–B Out Broadcast Message Elements

This proposal defines the latency for the ADS–B message from the time information enters the aircraft through the aircraft antenna(s) until the time it is transmitted from the aircraft. A specific limit between the time the information is received and then processed through onboard avionics is necessary to ensure timely transmission of information and to realize the benefits of the ADS–B system. As discussed previously, ADS–B Out transmits accurate and timely information more frequently than information transmitted under the current radar surveillance system. With ADS–B, information is sent to the aircraft from satellites, processed on the aircraft and sent to ground stations. The information would enter the aircraft through an antenna(s), be processed by the onboard avionics (e.g., navigation sensor, navigation processor, and either 1090ES or UAT broadcast links), then transmitted to the ground stations through another antenna(s) on either the 1090 or 978 MHz frequencies, depending upon the aircraft's avionics.

Under this proposal, the navigation sensor would process information received by the aircraft's antenna(s) and forward this information to the ADS–B broadcast link avionics in less than 0.5 seconds. That processed information would then be transmitted in the ADS–B message from the ADS–B Out broadcast link avionics in less than 1.0 second from the time it was received from the navigation sensor. This latency would support the proposed requirement that the aircraft transmit its position and velocity at least once per second while airborne, or while the aircraft is moving on the surface. Additionally, the aircraft would be required to transmit its position information at least once every 5 seconds while stationary on the airport surface.

Latency requirements for the reception and processing of ADS–B Out by the ground station for display to the ATC automation system are described in the FAA surveillance and broadcast services acquisition documents.[20]

7. Maintenance

This NPRM would not require additional maintenance requirements for the installation of ADS–B avionics equipment. The current requirements of 14 CFR 21.50, ''Instructions for continued airworthiness and manufacturer's maintenance manuals having airworthiness limitations sections,'' are applicable to all ADS–B equipment. Since any alteration of equipment is subject to the requirements of that section, the existing requirements would apply to any new avionics equipment installed in an aircraft.

C. Operational Procedures

1. Applicability

With specific and limited exceptions, the ADS–B Out performance requirements proposed here would apply to all aircraft operating in certain U.S. designated airspace.[21] These requirements would be applicable to operations conducted by domestic and foreign operators in U.S. territorial airspace. The efficiency and capacity benefits that can be realized with ADS–B Out are largely obtainable if all aircraft are equipped for ADS–B Out broadcast. There are some aircraft, however, that were not originally certified with an electrical system, or that have not been subsequently certified with such a system installed, for which installation of equipment that meets ADS–B Out performance standards is impractical. These aircraft may include certain airplanes, balloons, and gliders. There may be instances where a pilot of an aircraft without an electrical system (such as a glider) may want to operate in airspace where ADS–B Out performance standards would be required under this proposal. The procedures for requesting authorization to enter the airspace where ADS–B is required would be the same procedures used today for aircraft not equipped with a transponder to enter certain airspace. In these cases, an operator may request an ATC authorization to operate

[20] Final Program Requirements for Surveillance and Broadcast Services, En Route and Oceanic Services, Air Traffic Organization, Federal Aviation Administration.

[21] See section IV.c.2. for a further discussion of the airspace where ADS–B Out would be required.

in the airspace and the FAA addresses those requests on a case-by-case basis. In formulating this proposal, the FAA considered various options including whether to require ADS–B Out performance standards for aircraft based on the type of operation conducted (e.g., part 121 and 135 operations), or based on the type of aircraft (e.g., large or small). The agency concluded that there is no distinguishing operational need for differing performance standards based on aircraft type or category of the operation, as many different types of operators and aircraft operate in the same airspace.

The FAA also considered proposing ADS–B Out performance standards for aircraft operations at and above specified altitudes. Since aircraft operate at various altitudes between the en route and terminal environments, this option was dismissed as confusing to pilots and impractical to implement. ADS–B requirements based on specific altitudes could result in different equipment requirements applying within different segments of the same class of airspace.

Lastly, the FAA considered whether to propose ADS–B Out for all aircraft operations in domestic airspace (Classes A–G). Domestic airspace includes airspace over the territorial United States that extends out to 12 NM from the coastline that is controlled by ATC (Classes A, B, C, D, and E) and uncontrolled airspace (Classes G). While this would result in almost 100% of aircraft meeting ADS–B Out performance requirements and increase the number of identifiable aircraft in the NAS, it also would place an unnecessary financial and operational burden on aircraft operators who do not operate in controlled airspace, or who are not under ATC surveillance.

2. Airspace

In February 1988, the FAA promulgated an ATC transponder and altitude reporting equipment final rule, which established § 91.215 of 14 CFR and articulated the operating requirements for ATC transponder and altitude reporting equipment and use.[22] The rule specifies the airspace for which Mode A/C, and S transponders are required, and the process for when an operator may request a deviation from the transponder requirements. Under § 91.215, transponders are required for all aircraft operating in Classes A, B, and C airspace areas, and in all airspace at and above 10,000 feet MSL over the 48 contiguous United States and the District of Columbia. In addition, transponders are required for operations within 30 NM of an airport listed in 14 CFR part 91, Appendix D, from the surface upwards to 10,000 feet MSL. (The airports listed in Appendix D are in Class B airspace areas.)[23]

ADS–B Out would provide for enhanced surveillance in areas where SSR surveillance currently exists. Consequently, the FAA believes that it is reasonable to require that aircraft meet the performance requirements necessary for ADS–B Out for operation in airspace that currently requires transponders. Similar to § 91.215, proposed § 91.225 would require that aircraft meet ADS–B Out performance requirements to operate in Class A, Class B, and Class C airspace areas, and in Class E airspace areas at and above 10,000 ft MSL over the 48 contiguous United States and the District of Columbia. In addition, this proposal would require that aircraft meet ADS–B Out performance requirements to operate in Class E airspace over the Gulf of Mexico, from the coastline of the United States out to 12 NM at and above 3,000 feet MSL. Similar to the transponder requirements, ADS–B Out also would be required within 30 NM of an airport listed in 14 CFR part 91, appendix D, from the surface upward to 10,000 feet MSL.

This proposal would permit aircraft not originally certificated with an electrical system or not subsequently certified with such a system installed (such as a balloon or glider) to conduct operations without ADS–B Out in the airspace within 30 NM of an airport listed in part 91 appendix D if the operations are conducted: (1) Outside any Class B or Class C airspace area; and (2) below the altitude of the ceiling of a Class B or Class C airspace area designated for an airport or 10,000 feet MSL, whichever is lower.

Generally, Class A airspace is that airspace from 18,000 feet MSL to and including FL 600, including the airspace overlying the waters within 12 NM of the coastline of the United States. This proposal would not require aircraft to meet the proposed ADS–B Out performance standards for aircraft that operate in Class A airspace that extends beyond 12 NM from the U.S. coastline and that do not enter U.S. territorial airspace.[24]

Class B airspace is designated from the surface to 10,000 feet MSL surrounding the nation's busiest airports in terms of airport operations or passenger enplanements. (Class B airspace areas generally are configured and appear as an upside down wedding cake.) The configuration of each Class B airspace area is individually tailored and consists of a surface area and two or more layers, and is designed to contain all published instrument procedures. An ATC clearance is required for all aircraft to operate in the area, and all aircraft that are cleared receive separation services within the airspace. Under this proposal, ADS–B Out would be required for aircraft operating in Class B airspace areas. In addition, for those airports listed in part 91 appendix D, ADS–B Out would be required for operations within 30 NM of the airport from the surface up to 10,000 feet MSL. This area can experience a high volume of aircraft operations and complex transitions from the en route environment to the terminal area around the nation's busiest airports. Consequently, we expect ADS–B Out to result in better surveillance across a larger area, leading to better ATC situational awareness.

Generally, Class C airspace is designated from the surface to 4,000 feet above the airport elevation surrounding those airports that have an operational control tower, are serviced by a radar approach control, and have a certain number of IFR operations or passenger enplanements. Although the configuration of each Class C area is individually tailored, the airspace usually consists of a surface area with a 5 NM radius and an outer circle within a 10 NM radius that extends from no lower than 1,200 feet up to 4,000 feet above the airport elevation. Each person must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and must thereafter maintain those communications while within the airspace.

Similar to the transponder requirements, we are proposing that all

[22] Transponder with Automatic Altitude Reporting Capability Requirement, 53 FR 4306; February 12, 1988.

[23] This section excludes from the transponder requirements all aircraft not originally certificated with an electrical system or not subsequently certified with such a system installed, such as balloons or gliders. These operations may be conducted in the airspace within 30 nautical miles of an airport listed in part 91 appendix D provided that the operations are conducted: (1) Outside any Class A, Class B, or Class C airspace area; and (2) below the altitude of the ceiling of a Class B or Class C airspace area designated for any airport or 10,000 feet MSL, whichever is lower.

[24] There are numerous Offshore Airspace Areas that are designated as Class A airspace and the boundaries of those airspace areas extend beyond 12 NM from the coastline of the U.S. into international waters. Under agreement with ICAO, the U.S. provides ATC services in these areas and may designate the airspace accordingly in order to indicate to pilots the type of ATC services that may be provided.

aircraft in Class E airspace of the 48 contiguous United States and the District of Columbia, at and above 10,000 feet MSL, meet ADS–B Out performance requirements.

Additionally, the FAA proposes that aircraft operating in Class E airspace over the Gulf of Mexico, from the coastline of the United States out to 12 NM at and above 3,000 feet MSL, meet the performance requirements for ADS–B Out. The proposed 3,000 feet MSL will be the lowest altitude that surveillance and communication coverage will exist for the purposes of ATC services. The rule is restricted to 12 NM from the coastline, which is the extent of the NAS in that area.

This proposal includes an option for pilots to request an authorization from ATC to operate in certain designated airspace with aircraft that do not meet the ADS–B Out performance standards. As stated previously, aircraft that do not have an electrical system, and therefore are not ADS–B Out compliant, may receive an ATC authorization to operate in the designated airspace. This provision would provide ATC with the flexibility to control aircraft that may have been directed to turn off ADS–B or to reroute non-equipped aircraft through a regulated area if that is necessary for safety.[25]

ATC authorizations may contain conditions necessary to provide a level of safety equivalent to operation by an aircraft equipped with ADS–B Out equipment. ATC may not be able to grant authorization in all cases.

3. Pilot Procedures

In accordance with proper preflight actions,[26] each operator would have to verify ADS–B Out availability for the flight planned route through the appropriate flight planning information sources. If the aircraft cannot meet the proposed performance requirements using a given position service, the operator would have to use either a different, available position service, re-route, or reschedule the flight. Under this proposal, pilot procedures are expected to be minimal. Pilots would have to: (1) Check that the ADS–B avionics equipment is turned on and operating properly; (2) ensure that message elements (g)–(k) of part 91, appendix H, section 4 are entered during the appropriate phase of flight; (3) turn off the ADS–B equipment if directed by ATC; and (4) if notified by ATC that the aircraft's ADS–B information is not being transmitted, request special handling that may include accommodation (on a case-by-case basis), or direction to exit the present airspace.

4. Backup Surveillance Strategy

The FAA recognizes there are vulnerabilities in using a GPS system as the aircraft's position service. There are times when GPS may be unreliable in certain areas and during certain times due to planned testing or solar flare activity. Unintentional interference is historically infrequent in the U.S. In the event of GPS outages, a backup strategy is necessary for ATC to continue surveillance capability.

The FAA identified and analyzed several potential backup strategies. The strategies varied from SSR, active and passive multilateration, Distance Measuring Equipment (DME)/IRU, Satellite Navigation (SATNAV), and combinations thereof. The FAA reviewed the cost estimates and performance of the various combinations and conducted comparative safety assessments. In May 2006, the Surveillance/Positioning Backup Strategy Technical Team was formed to review candidate strategies. The team members consisted of representatives from air transport, general aviation, avionics manufacturers, and the FAA's Aircraft Certification Service and Air Traffic Organization. In addition, a steering committee was organized under the RTCA ADS–B Working Group and the RTCA Air Traffic Management Advisory Committee to ensure that user needs were being addressed.

The FAA specified that the backup strategy must meet certain minimum requirements to meet the needs of the airspace users. The strategy must be able to support ATC surveillance to at least the same extent as current back up surveillance capabilities. In other words, at least the same level of capacity must be maintained during a loss of GPS signal as would be experienced during a comparative loss of radar services today in both the terminal and en route areas over several days.[27]

The FAA has concluded that a strategy of maintaining a reduced network of SSRs best meets the agency's back up needs given the limitations of ADS–B surveillance capabilities. Under this strategy, secondary radar services will be provided in high density terminal airspace (surrounding approximately the top 40 airports in terms of capacity), all en route airspace above 18,000 feet MSL, and medium density terminal airspace above certain altitudes, as determined by proximate en route SSR coverage (identical to today's Center Radar Automated Radar Terminal Systems Processing (CENRAP) coverage). This approach would require retaining 40 terminal SSRs and 150 en route SSRs beyond 2020, which is approximately one-half of the quantity in use today. Primary surveillance radar services will be retained in all terminal areas covered by primary radar today (approximately 200 locations), to serve as the means of mitigating single aircraft avionics failures. No new avionics would be required to support this strategy. The legacy transponders (Mode A/C/S) continue to support secondary radar surveillance. A copy of the FAA's Surveillance/Positioning Backup Strategy Alternatives Analysis Final Report, dated December 8, 2006, has been placed in the docket for this rulemaking.

During interference outages of GNSS (scheduled or unscheduled), the FAA expects to revert to the backup ground-based surveillance system and temporarily allow operations without ADS–B Out in required airspace. Pilots would be notified of such action via the Notice to Airmen (NOTAM) system. The FAA also expects to revert to the backup surveillance system during significant degradation in the GPS constellation. When deciding to issue NOTAMs to allow operations by aircraft with inoperable ADS–B Out equipment, the FAA will weigh the impact of denying airspace access to those aircraft that do not comply with the performance requirements against the reduction in operational capability due to the limitations of the backup surveillance system.

5. Compliance Schedule for ADS–B Out Requirements

The FAA proposes that affected aircraft meet ADS–B Out performance requirements by January 1, 2020. The FAA's schedule for ADS–B Out calls for

[25] If the Air Traffic Controller identifies that the aircraft avionics is not operating properly (such as providing erroneous or incomplete information), the pilot would be instructed to turn off the avionics. A simple switch or button in the cockpit to disable ADS–B avionics would provide this feature. Aircraft would then be controlled using the backup surveillance system or procedurally. This is similar to the methods used today in removing faulty transponder information from a controllers display. Pilots currently have the capability to turn off transponders. Aircraft are then handled procedurally or through primary radar returns.

[26] See 14 CFR 91.103.

[27] Generally, a loss of radar services for a given area is mitigated in one of several ways: by providing terminal capabilities (e.g., 3 NM separations) with reduced coverage using a nearby terminal radar; by providing en route capabilities (e.g., 5 NM separations) with reduced coverage using the nearest en route radar; or by reversion to procedural separation if neither of the first two options are feasible.

the ground infrastructure, including the provision of broadcast services, to be in place and available by the end of 2013 where surveillance exists today. The FAA is committed to meeting this schedule, but if unforeseen circumstances prevent ADS–B Out services from being available by the end of 2013 where surveillance exists today, the FAA would follow notice and comment rulemaking procedures to adjust the compliance date. Although compliance of the rule would not be necessary until 2020, it is necessary to have the final requirements published to allow avionics manufacturers time to produce compliant equipment. It is also preferable to give operators time to schedule equipment installation consistent with the aircraft's normal maintenance cycle. A 10-year compliance window gives the aviation community ample time to manage costs and minimize the impact of ADS–B installation on their normal operations.

V. ADS–B In

A. Avionics

The FAA is not proposing to mandate ADS–B In performance requirements at this time. While ADS–B In provides substantial benefits to operators, it has not been identified as a requirement for maintaining the safety and efficiency of NAS operations at this time. However, this NPRM includes a discussion of ADS–B In because ADS–B Out transmissions provide the aircraft information viewed by the flight crew in aircraft equipped for ADS–B In. Operators who voluntarily equip with ADS–B In could receive additional benefits compared to those that equip only with ADS–B Out. ADS–B In provides the capability to display ADS–B message information to pilots in the flight deck. The ADS–B In function is a combination broadcast link processor (i.e., it receives information) and flight deck display.

The ADS–B Out broadcast message elements support the initial ADS–B In applications discussed in this proposal. However, future ADS–B In applications may require additional broadcast message elements in the ADS–B Out transmission. The reason for the differences is that the information displayed to ATC may be a subset of information displayed to the pilots. Additional ADS–B Out broadcast message elements beyond those described in this document could be needed to support a fully functional ADS–B In CDTI for future operational applications. Additional message elements cannot be defined until future applications have been developed. The current set of ADS–B Out message elements will meet the needs of the initial services and applications and the future applications currently pursued by the FAA.

As some operators may voluntarily equip with ADS–B In avionics to take advantage of emerging technology, the ground infrastructure will be designed to accommodate ADS–B Out and ADS–B In. In order to provide ADS–B In equipped aircraft with the capability to use the information transmitted, a service called ADS–R has been developed. In this proposal, ADS–R is considered part of the ground infrastructure that will need to be in place to enable a fully functional ADS–B system. ADS–R provides aircraft with a more complete traffic picture of other ADS–B equipped aircraft using a different data-link (i.e., 1090ES versus UAT). For example, ADS–R takes the aircraft's ADS–B information that is transmitted by 1090ES and ''re-broadcasts'' that information to any aircraft that is equipped for ADS–B In and uses UAT. ADS–R similarly makes the corresponding rebroadcast of information from UAT equipped aircraft to ADS–B In equipped aircraft using 1090ES. As stated previously, this proposal does not seek to require ADS–B In. The FAA does realize, however, that some operators may voluntarily equip with ADS–B In avionics to take advantage of emerging technology. The ADS–B ARC is investigating ways to encourage operators to equip with ADS–B prior to the compliance date of the rule. The FAA will review the ARC's recommendations on how to facilitate the transition between legacy surveillance and ADS–B.

B. Applications and Services

As this proposal lays the foundation for the entire ADS–B system, it is appropriate to briefly discuss the applications and services that would be available with ADS–B In. Functions and associated applications that enable an aircraft to be able to receive ADS–B messages from ground stations and from other aircraft are collectively referred to as ADS–B In. If aircraft are voluntarily equipped with ADS–B In, pilots could see real-time information similar to what ATC views and have access to similar services and applications. Pilots would have better situational awareness because their flight deck displays would depict all aircraft equipped with ADS–B or transponders. Pilots may be able to use this information to monitor and maintain safe separation from other aircraft with fewer instructions from ATC. At night and in poor visual conditions, pilots could also see where they are in relation to the ground using onboard avionics and terrain maps associated with a multi-function display. The information would be clear and accurate regardless of inclement weather conditions.

Also, like ATC, aircraft CDTIs could display precise locations of all ADS–B equipped aircraft and ground vehicles, along with data that shows their direction of movement in flight or on the airport surface. With this information, pilots would be able to follow the progress of other aircraft or ground vehicles using the cockpit display, and correlate that position by reference to outside visual cues. The increased position and traffic awareness would allow more efficient movement on airport surfaces by pilots.

Aircraft equipped with ADS–B In capabilities could receive traffic information for other aircraft regardless of whether those aircraft are equipped with a functional ADS–B system. Aircraft equipped with ADS–B In would also be able to identify other ADS–B equipped aircraft regardless of the broadcast link being used. This comprehensive air traffic situational awareness would be provided by Traffic Information Service-Broadcast (TIS–B) until all aircraft are equipped with ADS–B Out, at which time TIS–B would be decommissioned and the information would be transmitted by ADS–R. Existing radar surveillance information is provided to ground stations and sent out on both 1090ES and UAT as a part of the TIS–B message.

The FAA expects the following two services and five applications to be available to operators voluntarily equipping with ADS–B In:

• Traffic Information Service-Broadcast (TIS–B). This is a ground-based uplink report of traffic that is under surveillance by ATC. During implementation of the ADS–B system, TIS–B would provide surveillance information on aircraft that are not yet ADS–B equipped. The ground infrastructure would support air-to-air operations by broadcasting TIS–B messages on both the 978 MHz UAT and 1090 MHz ES broadcast links for targets detected and reported by radar or other surveillance systems. TIS–B would be available during the transition period and until all affected aircraft are equipped for ADS–B Out. Once all aircraft are equipped to meet ADS–B Out performance requirements, TIS–B would be decommissioned as it would no longer be necessary since aircraft would receive traffic information through ADS–B.

• Flight Information Service-Broadcast (FIS–B). FIS–B provides the broadcast of weather and non-control advisory information providing users aeronautical information supporting safe and efficient operations. FIS–B products include, but are not limited to, graphical and textual weather reports and forecasts, NextGen radar precipitation information, special use airspace information, NOTAMS, electronic pilot reports, and other similar meteorological and aeronautical information. FIS–B products would be uplinked using the 978 MHz UAT broadcast link, but would not be available on the 1090 MHz ES broadcast link. The FIS–B service could accommodate additional products in the future. Both government and commercial sources would provide uplink products.

The following applications would be available to all pilots whose aircraft are voluntarily equipped to receive ADS–B In messages:

• Airport Surface Situational Awareness. This application would reduce the potential for deviations, errors, and collisions through an increase in pilots' situational awareness while operating an aircraft on the airport movement area. Pilots would use a flight deck display to increase awareness of other traffic positions on the airport movement area. Additionally, the display may be used to determine the position of ground vehicles, e.g., snowplows, emergency vehicles, tugs, follow-me vehicles, and airport maintenance vehicles, if they meet ADS–B Out performance requirements. Surface vehicles operating on the movement area (runways and taxiways) would need to be ADS–B Out equipped.

• Final Approach and Runway Occupancy Awareness. This application would reduce the likelihood of pilot errors associated with runway occupancy and would improve the capability of the flight crew to detect ATC errors. It involves using a cockpit display to depict the runway environment and display traffic from the surface up to approximately 1,000 feet AGL on final approach. It would be used by the flight crew to help determine runway occupancy.

• Enhanced Visual Acquisition. This application would provide the pilots with enhanced traffic situational awareness in controlled and uncontrolled airspace and airports. The application uses a cockpit display to enhance out-of-the-window visual acquisition of air traffic. Pilots would refer to the display during the instrument scan to supplement visual observations. The display would be used to aid in initial detection of an aircraft or to receive further information on an aircraft that has been reported by ATC. The application provides the pilots with the relative range, altitude, and bearing of other aircraft.

• Enhanced Visual Approach. This application would enhance sequential approaches for aircraft cleared to maintain visual separation from another aircraft on the approach in order to maintain visual approach procedure operation arrival rates even during periods of reduced visibility or obstructions to vision (e.g., haze, fog, and sunlight). Pilots would have a cockpit display of nearby traffic that would continually update identity and position information to assist the pilots with achieving and maintaining visual contact with relevant traffic. Additional information such as range and speed would be provided to assist pilots in monitoring their distance from the preceding aircraft. The display may also be used to monitor aircraft on approach to parallel runways.

• Conflict Detection. This application would alert the pilot to potential conflicts with other aircraft and provide relevant traffic information. Aircraft equipped with a cockpit display have the capability to display aircraft location and projected flight path. More than simply displaying traffic, the application would alert pilots of developing conflicts. Also, the surveillance range afforded by ADS–B would enable alerts to be issued in time to resolve potential conflicts with minimum disruption to the flight path. The conflict detection application is an ADS–B-enabled capability for properly equipped aircraft and is not intended as a TCAS replacement.

ADS–B In is not limited to the reception of these services and applications. The ability to receive ADS–B In messages provides a platform for services that may be developed in the future by the FAA or by independent vendors.

Users with ADS–B In may also have greater predictability of flight duration because they would have more information on the state of air traffic and the procedures being used by air traffic controllers to handle traffic. Greater predictability of arrival and departure times could allow air carriers to have ground crews ready sooner, and with less margin of error. Shared situational awareness may also allow pilots to observe patterns in the flight of traffic around them and may increase the efficiency of their flight by allowing them to operate in concert with other traffic with less radio communication.

VI. FAA Experience With ADS–B

A. Capstone

The Capstone project was initially proposed as an operational demonstration program for Alaska in the Bethel and Yukon-Kuskokwim (Y–K) Delta area. Flights below 6,000 feet in the Y–K Delta are conducted in a non-radar environment. The only radar coverage in the area is high-altitude coverage for aircraft controlled from Anchorage. Capstone's traffic awareness function, which lets anyone with an ADS–B receiver see the locations and altitudes of Capstone-equipped aircraft, enhances situational awareness to aircraft operators in the Y–K Delta.

Phase II of Capstone, which extended the Capstone program into Southeast Alaska, officially began in March 2003. The FAA is integrating Phase II of the Capstone program into the national ADS–B program. Statewide deployment of ADS–B is expected to be completed by 2013.

Special Federal Aviation Regulation (SFAR) 97 allows suitably equipped aircraft to conduct IFR Area Navigation (RNAV) operations in Alaska on published air traffic routes using TSO–C145a/C146a navigation systems as the only means of IFR navigation. It also allows pilots to conduct IFR en route RNAV operations in Alaska using Special Minimum En Route Altitudes that are outside the operational service volume of ground-based navigation aids. This SFAR opened more than 40,000 square miles of airspace that included more than 1,500 NM of new routes. As discussed previously, SFAR No. 97 would remain in effect to supplement the requirements of this proposal.

According to FAA accident statistics compiled by the MITRE Corporation, the Capstone safety program reduced the aircraft fatal accident rates for Alaska part 135 operators equipped with Capstone avionics by 45%. While this accident reduction is not solely attributable to ADS–B, the ADS–B information in the flight deck did provide increased pilot awareness of surrounding traffic and directly contributed to the accident rate reduction. In addition, search and rescue efforts for individuals in equipped aircraft have been dramatically improved over efforts towards those in non-equipped aircraft. Knowing a more precise location of the aircraft's last known position has minimized the response times and reduced the search area.

B. Gulf of Mexico

Air traffic across the Gulf of Mexico has experienced significant growth over the past decade, at a rate twice that of domestic airspace. The northern portion of the Gulf of Mexico is home to one of the largest helicopter fleets in the world. More than 650 helicopters provide support for 5,500 off-shore oil and gas production platforms. The helicopter fleet in the Gulf of Mexico logs approximately 2.1 million operations per year. These operations are contained in a 500 mile area along the Texas, Louisiana, and Mississippi coastline, extending 250 miles into the Gulf of Mexico. The majority of helicopter operations take place between the surface and 7,000 feet. Much of this fleet flies without the ability to communicate with or be seen by ATC, or to obtain current weather data. When IFR conditions are prevalent, capacity is reduced nearly 95%. On IFR days, many operators are forced to cancel flights due to the lack of both en route and destination weather information and surveillance. Adverse weather conditions impact the region an average of one day out of every four.

On March 24, 2006, the National Traffic Safety Board (NTSB) issued safety recommendations A–06–19 through 23 to the FAA in response to a helicopter accident that occurred in the Gulf of Mexico on March 23, 2004. Specifically, the NTSB recommended, in A–06–21, that ''FAA should ensure that the infrastructure for the National Automatic Dependent Surveillance-Broadcast Program in the Gulf of Mexico is operational by fiscal year 2010.''

In May 2006, the FAA established a cooperative government/industry business relationship to enhance communications, weather, and surveillance capabilities in the Gulf of Mexico through a Memorandum of Agreement (MOA). Through the MOA, the FAA teamed with the Helicopter Association International and others to deliver a higher level of aviation service in the Gulf of Mexico. The FAA plans to build a Gulf of Mexico infrastructure to enhance low and high altitude voice communication and surveillance, and low altitude weather observation capability. While chiefly intended for helicopter use, the enhancements offer potential benefit to all aircraft operating in Gulf airspace. The MOA continues in effect for 5 years and can be renewed. The FAA plans to install communications equipment in the 2007/2008 timeframe, weather equipment in the 2008 timeframe, and surveillance equipment in the 2008/2009 timeframe. The FAA expects initial operational capability of the communications, weather, and surveillance equipment in the 2009/2010 timeframe.

C. UPS—Louisville

The FAA and the United Parcel Service (UPS) are working together to implement a system at Louisville, Kentucky (SDF) airport that would increase airport capacity and efficiency while significantly reducing vulnerability to runway incursion events and reduce the events themselves. UPS and the FAA have developed a concept to create a system that would use ADS–B surveillance at SDF, along with a Surface Management System and a scheduling and sequencing system to meet the demands of the future. ADS–B Out is expected to be operational on certain UPS aircraft by fall 2007. UPS is also installing a CDTI display for certain proposed operational applications such as merging and spacing, Surface Area Moving Management, and CDTI Assisted Visual Spacing capability in all of its B–757, B–767, B–747–400, A–300, and MD–11 fleets.

D. Surveillance in Non-Radar Airspace

Today, there are pockets of airspace across the NAS that are outside of radar coverage and are managed by ATC using non-radar procedural separation. While the FAA has not yet decided whether to place GBTs in these areas, it could decide to do so. Since the vast majority of the fleet would already be equipped with ADS–B Out, placing GBTs in these areas would result in the types of benefits experienced in Alaska and predicted for the Gulf of Mexico.

Presently ATC controls IFR operations in non-radar airspace using inefficient separation techniques and is unable to provide many advisory services otherwise available in a surveillance environment. Consequently, non-radar separation between aircraft in a non-radar environment within the domestic U.S. is up to 10 minutes (80 miles for jet traffic) compared to 3 or 5 miles in a radar environment. Operators would realize significant efficiency gains, if ATC were able to utilize traffic monitoring techniques currently only available in a surveillance environment (e.g., aircraft vectoring and speed control).

Surveillance capability also allows ATC to offer other safety-related services to both VFR and IFR aircraft, including traffic safety alerts when aircraft that are on conflicting courses, minimum safe altitude warnings (MSAW), and navigational assistance.

VII. ADS–B in Other Countries

The European Organisation for the Safety of Air Navigation, known as EUROCONTROL, a cooperative organization of 37 member states in Europe, is focused on developing a seamless, pan-European Air Traffic Management system. In support of its objective, EUROCONTROL is considering a plan to install ADS–B ground broadcast transceivers in European areas that do not have adequate radar coverage. EUROCONTROL proposed guidance is to use ADS–B for surveillance in medium density airspace where there is currently no surveillance capability.

In April 2007, the Australian Civil Aviation Safety Authority (CASA) published a Notice of Final Rule Making (NFRM)[28] adopting operational and technical standards for aircraft that are voluntarily equipped for ADS–B services in Australian airspace. CASA stated that it will not consider mandatory use of ADS–B until Airservices Australia makes a final decision on the replacement of its enroute radar systems. Until such determination is made, operators may choose to equip with ADS–B to operate in Australian airspace. Airservices Australia is installing ADS–B ground stations for operational use that can receive and process both RTCA DO–260 and DO–260A transmissions to apply a 5NM air traffic separation standard.[29]

NAV Canada is deploying ADS–B in northern Canada to provide surveillance in the airspace over Hudson Bay where there currently is no radar coverage today. Future deployments of ADS–B in Canadian airspace are targeted for the Northwest Territories and northern B.C., which also do not have radar coverage. NAV Canada anticipates having ADS–B in the rest of Canada as a replacement for, or complement to, radar.

The FAA is working with EUROCONTROL, Airservices Australia and NAV CANADA to internationally harmonize operational concepts and minimum safety and performance requirements for ADS–B.

VIII. Alternatives to ADS–B

Multilateration is a non-radar system that has limited deployment in the U.S. The FAA considered multilateration as an alternative to ADS–B. Multilateration is a process by which an aircraft's position is determined by measuring the time difference between the arrival of

[28] This NFRM summarizes the comments received in response to proposal 0601AS and presents CASA's evaluation of those comments. This document also sets forth the amendments for ADS–B equipage and related guidance material.

[29] The FAA's decision to propose performance standards that meet TSO–166a is because the FAA intends to use ADS–B transmissions to provide surveillance using the existing separation standards of 3 NM in terminal environments and 5 NM miles in the enroute environment.

the aircraft's signal to multiple receivers on the ground. At a minimum, multilateration requires upwards of four ground stations to deliver the same volume of coverage and integrity of information as ADS–B, due to the need to ''triangulate'' the aircraft's position. While both radar and multilateration meet today's surveillance needs, it would be substantially more costly to expand these systems than to implement ADS–B to meet future surveillance demands. Moreover, future uses of these systems would not provide a platform for air-to-air applications, as ADS–B does.

Radars have different update rates, accuracies, ranges, and functions. Alternatively, since ADS–B employs one type of receiving equipment, it does not have to accommodate for transition between differing surveillance systems. The consistency of the signal and information could increase the productivity of air traffic controllers by eliminating the need to account for different surveillance systems and environments. The deployment of secondary surveillance as a backup would entail some of the costs, but these would be significantly less than the costs of a full NAS-wide secondary surveillance solution.

IX. Rulemaking Notices and Analyses

Paperwork Reduction Act

This proposal contains the following new information collection requirements. As required by the Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)), the FAA has submitted the information requirements associated with this proposal to the Office of Management and Budget for its review.

Title: Automatic Dependent Surveillance-Broadcast (ADS–B) Out performance requirements to support air traffic control service.

Summary: This proposal requires performance requirements for certain avionics equipment on aircraft operating in specified classes of airspace within the United States National Airspace System. The proposed rule would facilitate the use of ADS–B for aircraft surveillance by FAA air traffic controllers to accommodate the expected increase in demand for air transportation. In addition to accommodating the anticipated increase in operations, this proposal, if adopted, would provide aircraft operators with a platform for additional flight applications and services.

Use of: This proposal would support the information needs of the FAA by requiring avionics equipment that continuously transmits aircraft information to be received by the FAA, via automation, for use in providing surveillance services.

Respondents (including number of): The likely respondents to this proposed information requirement are stated in the chart below.

Frequency: The FAA estimates that each respondent would incur costs of installing the equipment onboard the aircraft, as provided below. The FAA does not attribute any costs to each individual transmission from the electronics onboard the aircraft. Attempts to capture each aircraft transmission would be impossible and even if it could be captured, the cost would be minimal.

Annual Burden Estimate: This proposal would result in unit aircraft costs for new equipment installation and associated labor as follows:

ADS–B EQUIPMENT AND INSTALLATION HOURS & COST & RESPONDENTS

Aircraft group	Aircraft unit costs—includes equipment and installation costs		Installation costs by aircraft				Number of operators
			Labor costs		Labor hours		
	Low	High	Low	High	Low	High	
GA	$4,328	$17,283	$2,250	$5,000	30	50	n/a
TurboProp	12,906	463,706	minimal	23,000	minimal	230	2,522
TurboJet	3,862	135,736	minimal	23,000	minimal	230	294

Note: ADS–B Equipment could be hardware, software or combination of both.

The agency is soliciting comments to—

(1) Evaluate whether the proposed information requirement is necessary for the proper performance of the functions of the agency, including whether the information will have practical utility;

(2) Evaluate the accuracy of the agency's estimate of the burden;

(3) Enhance the quality, utility, and clarity of the information to be collected; and

(4) Minimize the burden of collecting information on those who are to respond, including by using appropriate automated, electronic, mechanical, or other technological collection techniques or other forms of information technology. Individuals and organizations may send comments on the information collection requirement by January 3, 2008, and should direct them to the address listed in the **ADDRESSES** section at the end of this preamble. Comments also should be faxed to the Office of Information and Regulatory Affairs, OMB, (202) 395–6974, Attention: Desk Officer for FAA.

According to the 1995 amendments to the Paperwork Reduction Act (5 CFR 1320.8(b)(2)(vi)), an agency may not collect or sponsor the collection of information, nor may it impose an information collection requirement unless it displays a currently valid OMB control number. The OMB control number for this information collection will be published in the **Federal Register** after the Office of Management and Budget approves it.

International Compatibility

In keeping with U.S. obligations under the Convention on International Civil Aviation, it is FAA policy to comply with ICAO SARPS to the maximum extent practicable. Considering that the long-term global capabilities of ADS–B are not yet fully defined, ICAO SARPS are still evolving and are not yet fully developed. However, the FAA researched existing ICAO requirements for ADS–B Out operations (using one of the ADS–B links, either 1090ES or UAT) to the maximum extent practicable. Specifically, the FAA reviewed applications to avionics and airframe manufacturers, air carriers, and general aviation operating under 14 CFR parts 91, 121, 125, or 135, and foreign air carriers conducting operations in U.S. airspace. The FAA has identified no differences with these proposed regulations.[30]

[30] ICAO references: PANS–ATM, Doc 4444, Amendment 4 (24/11/05), Procedures for Air Navigation Services—Air Traffic Management; Doc 9694, ICAO Manual of Air Traffic Services Data Link Applications; Annex 2, Rules of the Air; Annex 4, Aeronautical Charts; Annex 6 Part II, Operation of Aircraft; Annex 11, Air Traffic

Continued

Regulatory Evaluation, Regulatory Flexibility Determination, International Trade Impact Assessment, and Unfunded Mandates Assessment

Changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs that each Federal agency shall propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs. Second, the Regulatory Flexibility Act of 1980 (Pub. L. 96–354) requires agencies to analyze the economic impact of regulatory changes on small entities. Third, the Trade Agreements Act (Pub. L. 96–39) prohibits agencies from setting standards that create unnecessary obstacles to the foreign commerce of the United States. In developing U.S. standards, this Trade Act requires agencies to consider international standards and, where appropriate, that they be the basis of U.S. standards. Fourth, the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4) requires agencies to prepare a written assessment of the costs, benefits, and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local, or tribal governments, in the aggregate, or by the private sector, of $100 million or more annually (adjusted for inflation with base year of 1995). This portion of the preamble summarizes the FAA's analysis of the economic impacts of this proposed rule. We suggest readers seeking greater detail read the full regulatory impact analysis, a copy of which we have placed in the docket for this rulemaking.

In conducting these analyses, FAA has determined that this proposed rule: (1) Has benefits that justify its costs, (2) is an economically ''significant regulatory action'' as defined in section 3(f) of Executive Order 12866, (3) is ''significant'' as defined in DOT's Regulatory Policies and Procedures; (4) would have a significant economic impact on a substantial number of small entities; (5) would not create unnecessary obstacles to the foreign commerce of the United States; and (6) would impose an unfunded mandate on state, local, or tribal governments, or on the private sector by exceeding the threshold identified above. These analyses are summarized below.

Services; Annex 15, Aeronautical Information Services; Doc 9689, Manual for determination of separation minima; Circular 311, SASP Circular—ADS–B Comparative Assessment; Circular 278, National Plan for CNS/ATM Systems Guidance Material; Annex 10 Vol. IV, Amendment 77, Aeronautical Telecommunications; Doc 9871, Technical Provisions for Mode S Services and Extended Squitter (Approved draft to be published in 2006); Doc 9688, ICAO Manual on Mode S Specific Services.

Request for Comment

While we welcome and encourage, all comments on the regulatory evaluation, we specifically request comment in the regulatory evaluation as follows:

- We solicit comments from manufacturers of large category turbojet, regional turboprop and general aviation aircraft on when they intend to start delivering new aircraft to comply with the rule if enacted. We need clarification of the avionics currently installed on new production airplanes and expected enhancements that would occur without the rule. Lastly, we solicit comment regarding the remaining assumptions.
- We assumed the weight for an ADS–B Out transponder, on a GA aircraft, would be about the same as weight as existing transponders and therefore the change would be negligible and there would be no additional weight or fuel burn costs. We request comments from industry on this assumption.
- We request comments from industry on the estimated costs, maintenance intervals MTBF replacement, and MTTR requirements for the ADS–B Out transponder and position source units.
- The FAA solicits comments on the benefits that we have identified and estimated and whether there are any potential benefits of ADS–B that we have not identified.
- We solicit comments from the industry on what they expect avionics costs of equipping with ADS–B In to be as well as whether the industry will voluntarily equip and the benefits of ADS–B In equipage.
- We request comments from the aviation industry about FAA surveillance deployment strategies that could permit acceleration of realized benefits.
- The FAA seeks comment, with supportive justification, to determine the degree of hardship the proposed rule will have on these small entities.
- Overall, in terms of competition, this rulemaking reduces small operators ability to compete. We request comments from industry on the results of the competitive analysis.
- The FAA assumed that maintenance and replacement costs for ADS–B Out for GA aircraft equals zero because the maintenance and replacement times would occur beyond 2035. The FAA seeks comment on this assumption.

Total Benefits and Costs of this Rule

The demand for air travel is growing in the U.S. and around the world. The FAA's forecasts project a doubling in U.S. airline passenger traffic by 2025. The forecasts also show strong growth for general aviation, especially with the advent of very light jets.

The solution to managing the anticipated growth in the use of the NAS is the Next Generation Air Transportation System, or NextGen, which will assure the safe and efficient movement of people and goods as demand increases. NextGen will use technology to allow precise navigation, permit accurate real-time communication, and vastly improve situational awareness.

ADS–B is the chosen new technology for surveillance in the NextGen system. It is a key component in achieving many of the goals set forth in the Next Generation Air Transportation System (NextGen) Integrated Plan.

We review the following three alternatives for surveillance in this analysis:

1. Baseline radar—maintain the current radar based surveillance system and replace radar facilities when they wear out;
2. ADS–B—Aircraft operators equip to meet performance requirements proposed by the rule and the FAA provides surveillance services based on downlinked aircraft information.
3. Multilateration—The FAA would provide surveillance using multilateration.

The proposed rule requires aircraft to equip only with ADS–B Out when flying in certain airspace. Operators may choose to more fully equip with ADS–B In and Out, and so we also address these costs and benefits.

The estimated cost of this proposed rule ranges from a low of $2.3 billion ($1.6 billion at 7% present value) to a high of $8.5 billion dollars ($4.5 billion at 7% present value).[31] These costs include costs to the government, as well as to the aviation industry and other users of the airspace, to deploy ADS–B and are incremental to maintaining surveillance via current technology (radar). The aviation industry would begin incurring costs for avionics equipage in 2012 and would incur total costs ranging from $1.27 billion ($670 million at 7% present value)[32] to $7.46 billion ($3.6 billion at 7% present value)[33] with an estimated midpoint of

[31] Costs at 3% present value range from $1.9 billion to $6.3 billion.

[32] $950 million at 3% present value.

[33] $5.35 billion at 3% present value.

$4.32 billion ($2.12 billion at 7% present value) [34] from 2012 to 2035.

The estimated quantified potential benefits of the proposed rule are about $10 billion ($2.7 billion at 7% present value) [35] and primarily result from fuel, operating cost and time savings from more efficient flights.

The proposed rule would make it more likely that aircraft operators would equip with ADS–B In equipment, which could result in estimated additional benefits of $3.9 billion ($1.0 billion at 7% present value).[36] The additional cost of the ADS–B In ground segment is estimated at $533 million ($283 million at 7% present value).[37] We did not estimate the cost for aircraft operators to equip with ADS–B In because we concluded the requirements for ADS–B In are insufficient in detail and do not yet support the development of a cost estimate. The FAA will continue to study ADS–B In technology and intends to provide an adoption cost estimate for the final rule. Benefits of both ADS–B In and Out have been estimated at $13.8 billion ($3.7 billion at 7% present value).[38] Estimated costs of ADS–B In and Out (excluding ADS–B In avionics costs), relative to the radar baseline, range from $2.8 billion ($1.8 at 7% present value) [39] to $9.0 billion ($4.8 at 7% present value).[40]

While we do not have estimates of ADS–B In avionics costs, we can derive an upper bound for what that cost cannot exceed if the ADS–B In and Out scenario is to be cost beneficial relative to radar for each of the two possibilities described below.

Given that we have a range of costs (low to high) we considered two possibilities: (1) Low cost, and (2) high cost:

- We concluded that ADS–B In and Out would be cost beneficial at a present value of 7% if the costs for the ADS–B Out avionics are low ($670 million at 7% present value) and the avionics costs for ADS–B In do not exceed $1.85 billion at 7% present value.
- We also concluded that ADS–B In and Out would be cost beneficial at a 3% present value if the costs for the ADS–B Out avionics are low ($950 million at 3% present value) and the ADS–B In avionics costs do not exceed $5.3 billion at 3% present value or if the costs for the ADS–B Out avionics are high ($5.35 billion at 3% present value) and the ADS–B In avionics costs do not exceed $870 million.

ADS–B is a critical component of the Next Generation Air Transportation System Plan (NextGen) that is being developed to transform today's radar-based aviation system to handle increased aviation demand. By itself, ADS–B presents significant benefits, but as a component of the NextGen system the benefits will substantially increase. The Draft Regulatory Impact Analysis has been placed in the docket for this rulemaking.

Reduced Carbon Dioxide Emissions

Besides the cost savings made possible by this proposed rulemaking, there will also be potential environmental benefits. ADS–B is an enabling technology critical to the concept of operations for the Next Generation Air Transportation System (NextGen) plan. Under the NextGen operational concept there will be less fuel used on many flights because of fewer potential conflicts needing resolution, more efficient en route conflict resolution aircraft maneuvers, and more efficient taxi and ground idle operations. Additionally, having more precise knowledge of the position of an aircraft with ADS–B may assist the implementation of such environmentally friendly flight procedures like continuous descent arrivals (CDA) to be employed in higher density traffic times.

The FAA estimates that between 2017 and 2035 ADS–B technology would allow more efficient handling of potential en route conflicts, which will result in a total of 410 million gallons of fuel savings in the national airspace system over that time period. This decrease in fuel use would result in about 4 million metric tons less carbon dioxide emissions.[41] The increased use of continuous descent approaches that ADS–B would allow would lead to about 10 billion pounds of total fuel savings from 2017 through 2035. This would result in about 14 million tons less carbon dioxide emissions. Additionally, the FAA has estimated a decline in fuel use on airline flights over the Gulf of Mexico due to optimal routing because of this proposed rulemaking. This savings in fuel use would result in an additional cumulative decrease of 300,000 metric tons of carbon dioxide emissions over the 2012 to 2035 time period.

Reduced fuel consumption will also translate into fewer emissions such as oxides of nitrogen, which potentially impact, both local air quality and climate (as a greenhouse gas emission), as well as hydrocarbons and carbon monoxide-both of which impact local air quality. Reduction in local air quality impacts associated with increasing capacity is vital in maintaining compliance with national ambient air quality standards.

The FAA solicits comments on the benefits that we have identified and estimated and whether there are any potential benefits of ADS–B that we have not identified.

Initial Regulatory Flexibility Determination ADS–B

Introduction and Purpose of This Analysis

The Regulatory Flexibility Act of 1980 (Pub. L. 96–354) (RFA) establishes ''as a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of the businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure that such proposals are given serious consideration.'' The RFA covers a wide-range of small entities, including small businesses, not-for-profit organizations, and small governmental jurisdictions.

Agencies must perform a review to determine whether a rule will have a significant economic impact on a substantial number of small entities. If the agency determines that it will, the agency must prepare a regulatory flexibility analysis as described in the RFA.

However, if an agency determines that a proposed or final rule is not expected to have a significant economic impact on a substantial number of small entities, section 605(b) of the 1980 RFA provides that the head of the agency may so certify and a regulatory flexibility analysis is not required. The certification must include a statement providing the factual basis for this determination, and the reasoning should be clear.

The FAA believes that this proposal would result in a significant economic impact on a substantial number of small entities. The purpose of this analysis is

[34] $3.13 billion at 3% present value.

[35] $5.48 billion at 3% present value.

[36] $2.1 billion at 3% present value.

[37] $392 million when discounted by 3%.

[38] $7.6 billion at 3% present value.

[39] $2.3 billion at 3% present value.

[40] $6.7 billion at 3% present value.

[41] For more information on the methodology used to calculate this estimate, see ''ADS–B Benefits Enabled from Improved en Route Conflict Probe Performance'' in the docket established for this rulemaking. The specific data in this regulatory evaluation however, is more conservation than the data in the report just mentioned.

to provide the reasoning underlying the FAA determination.

Under Section 603(b) of the RFA, the analysis must address:

- Description of reasons the agency is considering the action,
- Statement of the legal basis and objectives for the proposed rule,
- Description of the record keeping and other compliance requirements of the proposed rule,
- All federal rules that may duplicate, overlap, or conflict with the proposed rule,
- Description and an estimated number of small entities to which the proposed rule will apply,
- Analysis of small firms' ability to afford the proposed rule,
- Estimation of the potential for business closures,
- Conduct a competitive analysis,
- Conduct a disproportionality analysis, and
- Describe the alternatives considered.

Reasons Why the Rule Is Being Proposed

Public Law 108–176, referred to as ''The Century of Aviation Reauthorization Act,'' was enacted December 12, 2003 (Pub. L. 108–176). This law set forth requirements and objectives for transforming the air transportation system to progress further into the 21st century. Section 709 of this statute requires the Secretary of Transportation to establish in the FAA a joint planning and development office (JPDO) to manage work related to the Next Generation Air Transportation System (NextGen). Among its statutorily defined responsibilities, the JPDO coordinates the development and utilization of new technologies to ensure that when available, they may be used to the fullest potential in aircraft and in the air traffic control system.

The FAA, the National Aeronautics and Space Administration (NASA) and the Departments of Commerce, Defense, and Homeland Security have launched an effort to align their resources to develop and further the NextGen. The goals of NextGen, as stated in section 709, are addressed by this proposal and include:

(1) Improve the level of safety, security, efficiency, quality, and affordability of the NAS and aviation services;

(2) take advantage of data from emerging ground-based and space-based communications, navigation, and surveillance technologies;

(3) be scalable to accommodate and encourage substantial growth in domestic and international transportation and anticipating and accommodating continuing technology upgrades and advances; and

(4) accommodate a wide range of aircraft operations, including airlines, air taxis, helicopters, general aviation, and unmanned aerial vehicles.

The JPDO was also charged to create and carry out an integrated plan for NextGen. The NextGen Integrated Plan,[42] transmitted to Congress on December 12, 2004, ensures that the NextGen system meets the air transportation safety, security, mobility, efficiency and capacity needs beyond those currently included in the FAA's Operational Evolution Plan (OEP). As described in the NextGen Integrated Plan, the current approach to air transportation, i.e., ground based radars tracking congested flyways and passing information among the control centers for the duration of the flights, is becoming operationally obsolete. The current system is increasingly inefficient and large increases in air traffic will only result in mounting delays or limitations in service for many areas.

This growth will result in more air traffic than the present system can handle. The current method of handling traffic flow will not be able to adapt to the highest volume and density of it in the future. It is not only the number of flights but also the nature of the new growth that is problematic, as the future of aviation will be much more diverse than it is today. For example, a shift of 2 percent of today's commercial passengers to micro-jets that seat 4–6 passengers would result in triple the number of flights in order to carry the same number of passengers. Furthermore, the challenges grow as other non-conventional aircraft, such as unmanned aircraft, are developed for special operations, e.g. forest fire fighting.

The FAA believes that ADS–B technology is a key component in achieving many of the goals set forth in the plan. This proposed rule embraces a new approach to surveillance that can lead to greater and more efficient utilization of airspace. The NextGen Integrated Plan articulates several large transformation strategies in its roadmap to successfully creating the Next Generation System. This proposal is a major step toward strategically ''establishing an agile air traffic system that accommodates future requirements and readily responds to shifts in demand from all users.'' ADS–B technology would assist in the transition to a system with less dependence on ground infrastructure and facilities, and provide for more efficient use of airspace.

[42] A copy of the Plan has been placed in the docket for this rulemaking.

Statement of the Legal Basis and Objectives

The FAA's authority to issue rules regarding aviation safety is found in Title 49 of the United States Code. Subtitle I, Section 106 describes the authority of the FAA Administrator. Subtitle VII, Aviation Programs, describes in more detail the scope of the agency's authority.

This rulemaking is promulgated under the authority described in Subtitle VII, Part A, Subpart I, Section 40103, Sovereignty and use of airspace, and Subpart III, section 44701, General requirements. Under section 40103, the FAA is charged with prescribing regulations on the flight of aircraft, including regulations on safe altitudes, navigating, protecting, and identifying aircraft, and the safe and efficient use of the navigable airspace. Under section 44701, the FAA is charged with promoting safe flight of civil aircraft in air commerce by prescribing regulations for practices, methods, and procedures the Administrator finds necessary for safety in air commerce.

This proposal is within the scope of sections 40103 and 44701 since it proposes aircraft performance requirements that would meet advanced surveillance needs to accommodate the projected increase in operations within the National Airspace System (NAS). As more aircraft operate within the U.S. airspace, improved surveillance performance is necessary to continue to balance the growth in air transportation with the agency's mandate for a safe and efficient air transportation system.

Projected Reporting, Recordkeeping and Other Requirements

We expect no more than minimal new reporting and recordkeeping compliance requirements to result from this proposed rule. Costs for the initial installation of new equipment and associated labor constitute a burden under the Paperwork Reduction Act and are accounted for in this document.

Overlapping, Duplicative, or Conflicting Federal Rules

We are unaware that the proposed rule will overlap, duplicate or conflict with existing Federal Rules.

Estimated Number of Small Firms Potentially Impacted

Under the RFA, the FAA must determine whether a proposed rule significantly affects a substantial number of small entities. This determination is typically based on small entity size and cost thresholds that vary depending on the affected industry. Using the size standards from the Small Business Administration for Air Transportation and Aircraft Manufacturing, we defined companies as small entities if they have fewer than 1,500 employees.[43]

We considered the economic impact on small-business part 91, 121, and 135 operators. Many of the General Aviation (GA) aircraft are operating in part 91 are not for hire or flown for profit so we will not include these operators in our small business impact analysis.

This proposed rule would become final in 2009 and fully effective in 2020. Although the FAA forecasts traffic and air carrier fleets to 2030, our forecasts do not have the granularity to determine if an operator will still be in business or will still remain a small business entity. Therefore we will use current U.S. operator's fleet and employment in order to determine the number of operators this proposal would affect.

We obtained a list of part 91, 121 and 135 U.S. operators from the FAA Flight Standards Service.[44] Using information provided by the U.S. Department of Transportation Form 41 filings, World Aviation Directory and ReferenceUSA, operators that are subsidiary businesses of larger businesses and businesses with more than 1,500 employees were eliminated from the list of small entities. In many cases the employment and annual revenue data was not public and we did not include these companies in our analysis. For the remaining businesses, we obtained company revenue and employment from the above three sources.

The methodology discussed above resulted in the following list of 34 U.S. part 91, 121 and 135 operators, with less than 1,500 employees, who operate 341 airplanes. Due to the sparse amount of publicly available data on internal company financial statistics for small entities, it is not feasible to estimate the total population of small entities affected by this proposed rule. These 34 U.S. small entity operators are a representative sample to assess the cost impact of the total population of small businesses, who operate aircraft affected by this proposed rulemaking.

Operator name	Number of aircraft
Air 1ST Aviation Companies of Oklahoma, Inc	9
Air Flight Enterprises Inc	2
Air Transport International	12
Aircraft Charter Services Inc	2
Allegiant Air	26
American Check Transport Inc	11
Anaconda Aviation Corp	2
Arrow Services	2
Bankair Inc	10
Caribbean Sun Airlines	6
Champion Air	16
Copper Station Holdings, LLC	1
EPPS Air Service, Inc	11
ERA Aviation Inc	9
Executive Airlines	38
Falcon Air Express	4
GOJET Airlines	15
Lynden Air Cargo	6
Miami Air International	11
Midwest Airlines	36
North American Airlines	9
Northeast Aviation, Inc	1
Northern Air Cargo	10
Omni Air International	16
Pace Airlines	8
Premier Jets Inc	1
Professional Aviation Services	4
Royal Air Freight, Inc	3
Ryan International Airlines	12
Samaritan's Purse	2
Sun Country Airlines	13
USA Jet Airlines	10
World Airways	17
XTRA Airways	6
Total	341

Cost and Affordability for Small Entities

To assess the cost impact to small business part 91, 121 and 135 operators, we contacted manufacturers, industry associations, and ADS–B equipage providers to estimate ADS–B equipage costs. We requested estimates of airborne installation costs, by aircraft model, for the output parameters listed in the *Equipment Specifications* section of the Regulatory Evaluation.

This proposed rule would become final in 2009 and fully effective in 2020. Although the FAA forecast traffic and air carrier fleets to 2030, our forecasts do not have the granularity to determine if an operator will still be in business or will still remain a small business entity. Therefore we will use current U.S. operator's revenues and apply the industry-provided costs in order to determine if this proposal would have a significant impact on a substantial number of small entity operators.

To satisfy the manufacturer's request to keep individual aircraft pricing confidential, we calculated a low, baseline, and high range of costs by equipment class. The baseline estimate equals the average of the low and high industry estimates. The dollar value ranges consist of a wide variety of avionics within each aircraft group. The aircraft architecture within each equipment group can vary, causing different carriage, labor and wiring requirements for the installation of ADS–B. Volume discounting versus single line purchasing also affects the dollar value ranges. On the low end, the dollar value may represent a software upgrade or OEM option change. On the high end, the dollar value may represent a new installation of upgraded transponder systems necessary to assure accuracy, reliability and safety. We used the estimated baseline dollar value cost by equipment class in determining the impact to small business entities.

We estimated each operator's total compliance cost by multiplying the baseline dollar value cost, by equipment class, by the number of aircraft each small business operator currently has in its fleet. We summed these costs by equipment class and group. We then measured the economic impact on small entities by dividing the estimated baseline dollar value compliance cost for their fleet by the small entity's annual revenue. Each equipment group operated by a small entity may have to comply with different requirements in the proposed rule depending on the state the aircraft's avionics. In the *ADS–B Out Equipage Cost Estimate* section of the Regulatory Evaluation we detail our methodology to estimate operator's total compliance cost by equipment group.

As shown in the following table, the ADS–B cost is estimated to be greater than two percent of annual revenues for 12 small entity operators and greater than one percent of annual revenues for 19 small entity operators.

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[43] 13 CFR part 121.201, Size Standards Used to Define Small Business Concerns, Sector 48–49 Transportation, Subsector 481 Air Transportation.

[44] AFS–260.

Operator Name	Annual Operating Revenue	P.V. Cost As A % of Revenue
GOJET Airlines	$12,202,479	15.37%
Air 1ST Aviation Companies of Oklahoma, Inc.	$1,750,000	10.39%
Air Flight Enterprises Inc.	$500,000	7.79%
Air Transport International	$182,156,862	6.68%
Aircraft Charter Services Inc.	$750,000	5.22%
Allegiant Air	$132,500,000	5.20%
American Check Transport Inc.	$15,500,000	5.20%
Anaconda Aviation Corp.	$750,000	4.29%
Arrow Services	$500,000	3.46%
Bankair Inc.	$13,000,000	3.46%
Caribbean Sun Airlines	$44,000,000	2.23%
Champion Air	$160,027,359	2.14%
Copper Station Holdings, LLC	$7,500,000	1.96%
EPPS Air Service, Inc.	$15,000,000	1.41%
ERA Aviation Inc.	$42,000,000	1.30%
Executive Airlines	$48,022,547	1.23%
Falcon Air Express	$6,330,275	1.14%
Lynden Air Cargo	$78,336,626	1.01%
Miami Air International	$83,794,847	1.00%
Midwest Airlines	$150,700,000	0.95%
North Ameriacan Airlines	$239,953,776	0.92%
Northeast Aviation, Inc.	$1,500,000	0.90%
Northern Air Cargo	$43,973,951	0.88%
Omni Air International	$311,215,362	0.87%
Pace Airlines	$56,605,449	0.54%
Premier Jets Inc	$1,000,000	0.47%
Professional Aviation Services	$500,000	0.43%
Royal Air Freight, Inc.	$500,000	0.43%
Ryan International Airlines	$126,316,672	0.37%
Samaritan's Purse	$242,000,000	0.36%
Sun Country Airlines	$260,000,000	0.31%
USA Jet Airlines	$127,405,144	0.17%
World Airways	$770,000,000	0.12%
XTRA Airways	$27,640,833	0.01%

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Thus, from this sample population, the FAA determined that a substantial number of small entities would be significantly affected by the proposed rule. Every small entity who operates an aircraft in the airspace defined by this proposal would be required to install ADS–B out equipage and therefore would be affected by this rulemaking.

Business Closure Analysis

For commercial operators, the ratio of present-value costs to annual revenue shows that 7 of 34 small business air operator firms analyzed would have rations in excess of five percent. Since many of the other commercial small business air operator firms do not make their annual revenue publicly available, it is difficult to assess the financial impact of this proposed rule on their business. To fully assess whether this proposed rule could force a small entity into bankruptcy requires more financial information than is publicly available.

The FAA seeks comment, with supportive justification, to determine the degree of hardship, and feasible alternative methods of compliance, the proposed rule will have on these small entities.

Competitive Analysis

The aviation industry is an extremely competitive industry with slim profit margins. The number of operators who entered the industry and have stopped operations because of mergers, acquisitions, or bankruptcy litters the history of the aviation industry.

The FAA analyzed five years of operating profits for the affected small-entity operators listed above. We were able to determine the operating profit for 18 of the 34 small business entities. The FAA discovered that 33% of these 18 affected operator's average operating profit is negative. Only four of the 18 affected operators had average annual operating profit that exceeded $10,000,000. These results are shown in the following table.

Average Annual Operating Profit						
Operator	2002	2003	2004	2005	2006	Average
Air Transport International	$25,259,594	$20,516,387	$29,553,564	$35,070,648	$11,613,977	$24,402,834
Allegiant Air	-$631,187	$1,429,851	$6,346,342	$8,517,922	$8,651,000	$4,862,786
Caribbean Sun	$0	$0	-$23,190,481	-$29,617,061	-$18,794,128	-$14,320,334
Champion Air	$18,321,113	$6,035,660	$2,143,909	$9,311,269	$1,149,074	$7,392,205
Executive Airlines	-$16,924,371	$12,000,869	$16,369,047	-$9,142,157	$9,762,306	$2,413,139
Falcon Air Express	-$3,899,762	-$3,419,760	-$444,872	-$7,844,115	-$1,739,524	-$3,469,607
GOJET Airlines	$0	$0	$0	-$3,298,171	$9,671,520	$1,274,670
Lynden Air Cargo	$13,412,317	$10,926,496	$14,211,808	$14,090,263	$12,658,937	$13,059,964
Miami Air	$2,779,976	$5,879,393	$7,783,233	$10,980,149	$5,640,357	$6,612,622
Midwest Express	-$16,302,342	-$18,946,585	-$38,369,211	-$38,214,446	$930,783	-$22,180,360
North American	-$745,507	$17,222,024	$672,389	$7,960,614	-$1,788,609	$4,664,182
Northern Air Cargo	$1,314,387	$167,433	-$237,756	-$389,134	$428,445	$256,675
Omni Air Express	$3,483,654	$43,612,117	$60,934,518	$60,852,750	$47,709,288	$43,318,465
Pace Aviation	-$1,486,919	-$3,369,128	-$2,431,661	-$5,574,974	-$3,081,794	-$3,188,895
Ryan International	$3,304,520	$4,518,526	$8,184,232	-$407,782	-$278,197	$3,064,260
Sun Country	-$16,686,898	$1,374,448	-$628,461	-$11,140,311	-$121,934	-$5,440,631
USA Jet Airlines	-$6,189,176	-$8,873,208	-$60,794	-$2,011,326	-$15,142,008	-$6,455,302
World	$9,071,000	$28,429,000	$40,903,000	$52,493,000	-$1,261,000	$25,927,000

In this competitive industry, cost increases imposed by this proposed regulation would be hard to recover by raising prices, especially by those operators showing an average five-year negative operating profit. Further, large operators may be able to negotiate better pricing from outside firms for inspections and repairs, so small operators may need to raise their prices more than large operators. These factors make it difficult for the small operators to recover their compliance costs by raising prices. If small operators cannot recover all the additional costs imposed by this regulation, market shares could shift to the large operators.

Small operators successfully compete in the aviation industry by providing unique services and controlling costs. To the extent the affected small entities operate in niche markets enhances small entity's ability to pass on costs. Currently small operators are much more profitable than the established major scheduled carriers. This proposed rule would offset some of the advantages of older aircraft lower capital cost.

Overall, in terms of competition, this rulemaking reduces small operators ability to compete. We request comments from industry on the results of the competitive analysis.

Disproportionality Analysis

The disproportionately higher impact of the proposed rule on the fleets of small operators result in disproportionately higher costs to small operators. Due to the potential of fleet discounts, large operators may be able to negotiate better pricing from outside sources for inspections, installation, and ADS–B hardware purchases. Based on the percent of potentially affected current airplanes over the analysis period, small U.S. business operators may bear a disproportionate impact from the proposed rule.

Comments received and final rule changes on regulatory flexibility issues will be addressed in the statement of considerations for the final rule.

Analysis of Alternatives

Alternative One

The status quo alternative has compliance costs to continue the operation and commissioning of radar sites. The FAA rejected this status quo alternative because the ground based radars tracking congested flyways and passing information among the control centers for the duration of the flights is becoming operationally obsolete. The current system is not efficient enough to accommodate the estimated increases in air traffic, which would result in mounting delays or limitations in service for many areas.

Alternative Two

This alternative would employ a technology called multilateration. Multilateration is a separate type of secondary surveillance system that is not radar and has limited deployment in the U.S. At a minimum, multilateration requires upwards of four ground stations to deliver the same volume of coverage and integrity of information as ADS–B, due to the need to ''triangulate'' the aircraft's position. Multilateration is a process wherein an aircraft position is determined using the difference in time of arrival of a signal from an aircraft at a series of receivers on the ground. Multilateration meets the need for accurate surveillance and is less costly than ADS–B (but more costly than radar), but cannot achieve the same level of benefits that ADS–B can. Multilateration would provide the same benefits as radar, but at a higher cost.

Alternative Three

This alternative would provide relief by having the FAA provide an exemption to small air carriers from all requirements of this rule. This alternative would mean that the small air carriers would rely on the status quo ground based radars tracking their flights and passing information among the control centers for the duration of the flights. This alternative would require compliance costs to continue for the commissioning of radar sites. Air traffic controller workload and training costs would increase having to employ two systems in tracking aircraft. Small entities may request ATC deviations prior to operating in the airspace affected by this proposal. It would also be contrary to our policy for one level of safety in part 121 operations to exclude certain operators simply because they are small entities. Thus, this alternative is not considered to be acceptable.

Alternative Four

This alternative is the proposed ADS–B rule. ADS–B does not employ different classes of receiving equipment or provide different information based on its location. Therefore, controllers will not have to account for transitions between surveillance solutions as an aircraft moves closer or farther away from an airport. In order to meet future demand for air travel without significant delays or denial of service, ADS–B was found to be the most cost effective solution to maintain a viable air transportation system. ADS–B provides a wider range of services to aircraft users and could enable applications unavailable to multilateration or radar.

Trade Impact Assessment

The Trade Agreements Act of 1979 (Pub. L. 96–39) prohibits Federal agencies from establishing any standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. Legitimate domestic objectives, such as safety, are not considered unnecessary obstacles. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards.

ICAO is developing a set of standards that are influenced by, and similar to, the U.S. RTCA developed standards. Initial discussions with the international community lead us to conclude that U.S. aircraft operating in foreign airspace would not have to add any equipment or incur any costs in addition to what they would incur to operate in domestic airspace under this proposed rulemaking. Foreign operators may incur additional costs to operate in U.S. airspace, if their national rules, standards and, current level of equipage are different than those required by this proposed rule. The FAA is actively engaged with the international community to ensure that the international and US. ADS–B standards are as compatible as possible. For a fuller discussion of what other countries are planning with regard to ADS–B, see Section VII of this preamble. By 2020 ICAO standards may change to harmonize with this proposed rule and foreign operators will not have to incur additional costs.

Unfunded Mandates Assessment

Title II of the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4) requires each Federal agency to prepare a written statement assessing the effects of any Federal mandate in a proposed or final agency rule that may result in an expenditure of $100 million or more (adjusted annually for inflation with the base year 1995) in any one year by State, local, and tribal governments, in the aggregate, or by the private sector; such a mandate is deemed to be a ''significant regulatory action.'' The FAA currently uses an inflation-adjusted value of $128.1 million in lieu of $100 million. This proposed rule is not expected to impose significant costs on small governmental jurisdictions such as state, local, or tribal governments, but the FAA calls for comment on whether this expectation is correct. However, this proposed rule would result in an unfunded mandate because it would result in expenditures in excess of an inflation-adjusted value of $128.1 million. We have considered three alternatives to this rulemaking, which are discussed in section 4.0 and in the regulatory flexibility analysis in section 7.

Executive Order 13132, Federalism

The FAA has analyzed this proposed rule under the principles and criteria of Executive Order 13132, Federalism. We determined that this action would not have a substantial direct effect on the States, on the relationship between the national Government and the States, or on the distribution of power and responsibilities among the various levels of government, and therefore would not have federalism implications.

Environmental Analysis

FAA Order 1050.1E identifies FAA actions that are categorically excluded from preparation of an environmental assessment or environmental impact statement under the National Environmental Policy Act in the absence of extraordinary circumstances. The FAA has determined this proposed rulemaking action qualifies for the categorical exclusion identified in paragraph 312f and involves no extraordinary circumstances.

Regulations That Significantly Affect Energy Supply, Distribution, or Use

The FAA has analyzed this NPRM under Executive Order 13211, Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use (May 18, 2001). We have determined that it is not a ''significant energy action'' under the executive order because it is not a ''significant regulatory action'' under Executive Order 12866, and it is not likely to have a significant adverse effect on the supply, distribution, or use of energy.

List of Subjects in 14 CFR Part 91

Aircraft, Airmen, Air traffic control, Aviation safety, Reporting and recordkeeping requirements.

The Proposed Amendment

In consideration of the foregoing, the Federal Aviation Administration proposes to amend chapter I of title 14, Code of Federal Regulations, as follows:

PART 91—GENERAL OPERATING AND FLIGHT RULES

1. The authority citation for part 91 continues to read as follows:

Authority: 49 U.S.C. 106(g), 1155, 40103, 40113, 40120, 44101, 44111, 44701, 44709, 44711, 44712, 44715, 44716, 44717, 44722, 46306, 46315, 46316, 46504, 46506–46507, 47122, 47508, 47528–47531, articles 12 and 29 of the Convention on International Civil Aviation (61 stat.1180).

2. Amend § 91.1 by revising paragraph (b) to read as follows:

§ 91.1 Applicability.

* * * * *

(b) Each person operating an aircraft in the airspace overlying the waters between 3 and 12 nautical miles from the coast of the United States must comply with §§ 91.1 through 91.21; §§ 91.101 through 91.143; §§ 91.151 through 91.159; §§ 91.167 through 91.193; § 91.203; § 91.205; §§ 91.209 through 91.217; § 91.221, § 91.225; §§ 91.303 through 91.319; §§ 91.323 through 91.327; § 91.605; § 91.609; §§ 91.703 through 91.715; and § 91.903.

* * * * *

3. Revise § 91.217 to read as follows:

§ 91.217 Data correspondence between automatically reported pressure altitude data and the pilot's altitude reference.

(a) No person may operate any automatic pressure altitude reporting equipment associated with a radar beacon transponder—

(1) When deactivation of that equipment is directed by ATC;

(2) Unless, as installed, that equipment was tested and calibrated to transmit altitude data corresponding within 125 feet (on a 95 percent probability basis) of the indicated or calibrated datum of the altimeter

normally used to maintain flight altitude, with that altimeter referenced to 29.92 inches of mercury for altitudes from sea level to the maximum operating altitude of the aircraft; or

(3) Unless the altimeters and digitizers in that equipment meet the standards of TSO–C10b and TSO–C88, respectively.

(b) After January 1, 2020, no person may operate any automatic pressure altitude reporting equipment associated with a radar beacon transponder or with ADS–B Out equipment unless the pressure altitude reported for ADS–B Out and Mode C/S is derived from the same source for aircraft equipped with both a transponder and ADS–B Out.

4. Add § 91.225 to read as follows:

§ 91.225 Automatic Dependent Surveillance-Broadcast (ADS–B) Out equipment and use.

(a) After January 1, 2020, and unless otherwise authorized by ATC, no person may operate an aircraft below Flight Level 240 (FL240) and in airspace described in paragraph (b) of this section unless the aircraft is equipped with ADS–B Out equipment that:

(1) Meets the performance requirements in TSO–C166a (1090ES), or later version; or

(2) Meets TSO–C154b (UAT), or later version; and

(3) Meets the requirements in part 91, Appendix H;

(b) Airspace:

(1) Class A airspace below FL240;

(2) Class B and Class C airspace areas;

(3) All aircraft in all airspace within 30 nautical miles of an airport listed in appendix D, section 1 of this part from the surface upward to 10,000 feet MSL;

(4) All aircraft in all airspace above the ceiling and within the lateral boundaries of a Class B or Class C airspace area designated for an airport upward to 10,000 feet MSL.

(c) After January 1, 2020, and unless otherwise authorized by ATC, no person may operate an aircraft at or above FL240 unless the aircraft is equipped with ADS–B Out equipment that:

(1) Meets the performance requirements in TSO–C166a or later version; and

(2) Meets the requirements of part 91, Appendix H.

(d) The requirements of paragraphs (a) and (c) of this section, as appropriate, apply to:

(1) All aircraft in Class E airspace over the Gulf of Mexico from the coastline of the United States out to 12 nautical miles at and above 3,000 feet MSL;

(2) All aircraft, except for any aircraft that was not originally certificated with an electrical system, or which has not subsequently been certified with such a system installed, including balloons and gliders, in Class E airspace within the 48 contiguous states and the District of Columbia at and above 10,000 feet MSL.

(e) The requirements of paragraphs (a), (c), and (d) of this section do not apply to any aircraft that was not originally certificated with an electrical system, or which has not subsequently been certified with such a system installed, including balloons and gliders, which may conduct operations without ADS–B Out in airspace within 30 nautical miles of an airport listed in appendix D, section 1 of this part provided such operations are conducted:

(1) Outside any Class B or Class C airspace area; and

(2) Below the altitude of the ceiling of a Class B or Class C airspace area designated for an airport, or 10,000 feet MSL, whichever is lower.

(f) Each person operating an aircraft equipped with ADS–B Out must operate this equipment in the transmit mode at all times except as otherwise directed by ATC.

(g) Requests for ATC authorized deviations must be made to the ATC facility having jurisdiction over the concerned airspace within the time periods specified as follows:

(1) For operation of an aircraft with an inoperative ADS–B Out, to the airport of ultimate destination, including any intermediate stops, or to proceed to a place where suitable repairs can be made or both, the request may be made at any time.

(2) For operation of an aircraft that is not equipped with ADS–B Out, the request must be made at least one hour before the proposed operation.

5. Amend appendix D to part 91 by revising section 1 introductory text to read as follows:

Appendix D to Part 91—Airports/Locations: Special Operating Restrictions

Section 1. Locations at which the requirements of § 91.215(b)(2) and § 91.225(b)(3) apply. The requirements of § 91.215(b)(2) and § 91.225(b)(3) apply below 10,000 feet above the surface within a 30-nautical-mile radius of each location in the following list:

* * * * *

6. Add appendix H to part 91 to read as follows;

Appendix H—Performance Requirements for Automatic Dependent Surveillance—Broadcast (Ads–B) Out

Section 1. Terms of Reference

ADS–B Out is a function of an aircraft's onboard avionics that periodically broadcasts the aircraft's state vector (3-dimensional position and 3-dimensional velocity) and other required information as described in this appendix.

ADS–B Out operating requirements are defined in 14 CFR 91.225.

Navigation Accuracy Category for Position (NACp) specifies the accuracy of reported aircraft's position as defined in TSO–C166a and TSO–C154b.

Navigation Accuracy Category for Velocity (NACv) specifies the accuracy of reported aircraft's velocity as defined in TSO–C166a and TSO–C154b.

Navigation Integrity Category (NIC) specifies an integrity containment region around the aircraft's reported position, as defined in TSO–C166a and TSO–C154b.

Navigation Position Sensor is the equipment installed onboard an aircraft used to process and transmit aircraft position (e.g. location, latitude and longitude, state vector) information.

Surveillance Integrity Level (SIL) indicates the potential risk that the reported aircraft's position is outside the integrity containment region described by the NIC parameter, as defined in TSO–C166a and TSO–C154b.

Section 2. 1090ES and UAT Broadcast Links and Power Requirements

(a) Aircraft operating above FL240 with equipment installed that meets the minimum performance requirements of TSO–C166a or later version, must meet the performance requirements of Class A1, A2, A3, or B1 equipment as defined in TSO–C166a or later version.

(b) Aircraft operating in airspace designated for ADS–B Out and below FL240 must have equipment installed that meets the performance requirements of either:

(1) Class A1, A2, A3 or B1 equipment as defined in TSO–C166a or later version; or

(2) Class A1H, A2, A3, or B1 equipment as defined in TSO–C154b or later version.

Section 3. ADS–B Out Performance Requirements for NIC, NAC, and SIL

(a) For aircraft broadcasting ADS–B Out as required under § 91.225(a), (c), and (d):

(1) The aircraft's NACp for the positioning source must be greater than or equal to 9;

(2) The aircraft's NACv for the positioning source must be greater than or equal to 1;

(3) The aircraft's NIC must be greater than or equal to 7; and

(4) The aircraft's SIL must be 2 or 3.

(b) Changes in the NIC, NAC, or SIL must be broadcast within 10 seconds.

Section 4. Minimum Broadcast Message Element Set for ADS–B Out

Each aircraft must broadcast the following information, as defined in TSO–C166a or later version, or TSO–C154b or later version. The pilot must enter information for message elements (g)–(k) of this section during the appropriate phase of flight:

(a) The length and width of the aircraft;

(b) An indication of the aircraft's lateral and longitudinal position;

(c) An indication of the aircraft's barometric pressure altitude;

(d) An indication of the aircraft's velocity;

(e) An indication if TCAS II or ACAS is installed and operating in a mode that can generate resolution advisory alerts;

(f) If an operable TCAS II or ACAS is installed, an indication if a resolution advisory is in effect;

(g) An indication if the flight crew has selected to receive ATC services;

(h) An indication of the Mode 3/A transponder code specified by ATC;

(i) An indication of the aircraft's call sign that is submitted on the flight plan, or the aircraft's registration number;

(j) An indication if the flight crew has identified an emergency and if so, the emergency status being transmitted;

(k) An indication of the aircraft's ''IDENT'' to ATC;

(l) An indication of the aircraft assigned ICAO 24-bit address;

(m) An indication of the aircraft's emitter category;

(n) An indication whether a cockpit display of traffic information (CDTI) is installed and operable; and

(o) An indication of the aircraft's geometric altitude.

Section 5. ADS–B Latency Requirements

(a) Upon receipt of the information by the aircraft antenna(s), the navigation position sensor must process the information in less than 0.5 seconds.

(b) The processed information from the navigation position sensor must be transmitted in the ADS–B Out message in less than 1.0 second.

(c) The aircraft must transmit its position and velocity at least once per second while airborne or while moving on the airport surface.

(d) The aircraft must transmit its position at least once every 5 seconds while stationary on the airport surface.

Issued in Washington, DC, on October 1, 2007.

Michael A. Cirillo,

Vice President, System Operations Services.

Rick Day,

Vice President, En Route and Oceanic Services.

[FR Doc. 07–4938 Filed 10–2–07; 9:08 am]

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DEPARTMENT OF HOMELAND SECURITY

Coast Guard

33 CFR Part 165

[CCGD05–07–092]

RIN 1625–AA00

Safety Zone: Christmas Holiday Boat Parade and Fireworks, Appomattox River, Hopewell, VA

AGENCY: Coast Guard, DHS.

ACTION: Notice of proposed rulemaking.

SUMMARY: The Coast Guard proposes to establish a 600 foot radius safety zone in the vicinity of Hopewell, VA centered on position 37–19.18′ N/077–16.93′ W (NAD 1983) in support of the Christmas Holiday Boat Parade and Fireworks Event. This action is intended to restrict vessel traffic on the Appomattox River as necessary to protect mariners from the hazards associated with fireworks displays.

DATES: Comments and related material must reach the Coast Guard on or before November 5, 2007.

ADDRESSES: You may mail comments and related material to Commander, Sector Hampton Roads, Norfolk Federal Building, 200 Granby St., 7th Floor, Attn: Lieutenant Junior Grade TaQuitia Winn, Norfolk, VA 23510. Sector Hampton Roads maintains the public docket for this rulemaking. Comments and material received from the public, as well as documents indicated in this preamble as being available in the docket, will become part of this docket and will be available for inspection or copying at the Norfolk Federal Building between 9 a.m. and 2 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: Lieutenant Junior Grade TaQuitia Winn, Assistant Chief, Waterways Management Division, Sector Hampton Roads at (757) 668–5580.

SUPPLEMENTARY INFORMATION:

Request for Comments

We encourage you to participate in this rulemaking by submitting comments and related material. If you do so, please include your name and address, identify the docket number for this rulemaking, CGD05–07–092, and indicate the specific section of this document to which each comment applies, and give the reason for each comment. Please submit all comments and related material in an unbound format, no larger than 8½ by 11 inches, suitable for copying. If you would like to know they reached us, please enclose a stamped, self-addressed postcard or envelope. We will consider all comments and material received during the comment period. We may change this proposed rule in view of them.

Public Meeting

We do not plan to hold a public meeting, but you may submit a request for a meeting by writing to the Commander, Sector Hampton Roads at the address under **ADDRESSES** explaining why one would be beneficial. If we determine that one would aid this rulemaking, we will hold one at a time and place announced by a later notice in the **Federal Register**.

Background and Purpose

On December 1, 2007, the Christmas Holiday Boat Parade and Fireworks event will be held on the Appomattox River in Hopewell, VA. Due to the need to protect mariners and spectators from the hazards associated with the fireworks display, vessel traffic will be temporarily restricted within 600 feet of the display.

Discussion of Proposed Rule

The Coast Guard proposes to establish a 600 foot radius safety zone on specified waters of the Appomattox River in the vicinity of Hopewell, VA centered on position 37–19.18′ N/077–16.93′ W (NAD 1983). This regulated area will be established in the interest of public safety during the Christmas Holiday Boat Parade and Fireworks event and will be enforced from 6 p.m. on December 1, 2007 to 8 p.m. on December 2, 2007. General navigation in the safety zone will be restricted during the event. Except for participants and vessels authorized by the Captain of the Port or his designated Coast Guard Representative on scene, no person or vessel may enter or remain in the regulated area.

Regulatory Evaluation

This proposed rule is not a ''significant regulatory action'' under section 3(f) of Executive Order 12866, Regulatory Planning and Review, and does not require an assessment of potential costs and benefits under section 6(a)(3) of that Order. The Office of Management and Budget has not reviewed it under that Order.

We expect the economic impact of this proposed rule to be so minimal that a full Regulatory Evaluation under the regulatory policies and procedures of DHS is unnecessary. Although this proposed regulation would restrict access to the regulated area, the effect of this rule will not be significant because: (i) The safety zone will be in effect for a limited duration of time; and, (ii) the Coast Guard will provide notifications via maritime advisories so mariners can adjust their plans accordingly.

Small Entities

Under the Regulatory Flexibility Act (5 U.S.C. 601–612), we have considered whether this proposed rule would have a significant economic impact on a substantial number of small entities. The term ''small entities'' comprises small businesses, not-for-profit organizations that are independently owned and operated and are not dominant in their fields, and governmental jurisdictions with populations of less than 50,000.